

AN INVITRO EVALUATION OF VARIOUS BLEACHING AGENTS' PENETRATION INTO PULP CHAMBER IN CLASS V CAVITIES RESTORED WITH DIFFERENT RESTORATIVE MATERIALS

Dr. Noushad MC; Dr. (Prof) C.V.Pradeep; Dr. Subin Barath

ABSTRACT

Cosmetic dentistry has focused on tooth whitening in the past few years. Bleaching has been advocated as a simple and conservative alternative to the various methods of restoration of discoloured and pulp less teeth.

Many materials have been used for restoring cervical lesion including composite resins and glass ionomer cements. When the bleaching agent is applied to a restored tooth, the properties of the restorative materials may be affected.

In this study the penetration of peroxide bleaching agents into pulp chamber of the teeth restored with composite resin, poly acid-modified composite resin and glass ionomer cements was evaluated.

INTRODUCTION

The lightening of the colour of the tooth through the application of chemical agents to oxidize the organic pigmentation in the tooth is referred to as bleaching. Discoloured tooth has a multi factorial etiology resulting from intrinsic and extrinsic stains of the two structure, injury and various physiological processes. Both in office and at home treatment methods have captured the attention of the lay public through out the world.

The aim this study was to evaluate penetration of peroxide bleaching agents into pulp chamber of the teeth restored with composite resin, poly acid-modified composite resin and glass ionomer cements.

MATERIALS AND METHOD

75 human extracted, non carious, maxil-

	GROUPS	RESTORATORATIVE MATERIALS			
		Group A Z 100	Group B Dyract	Group C Fuji VIII	Group D Fuji IX
Bleaching agents	10% Carbamide peroxide	I	II	III	IV
	20% Carbamide peroxide	V	VI	VII	VIII
	35% Carbamide peroxide	IX	X	XI	XII

Sub group contains 5 teeth each, Group E kept as control.

lary anterior teeth were collected from Dept of Oral and Maxillofacial Surgery. After cleaning, the teeth were stored in distilled water. The teeth were divided into 5 main groups (A, B, C, D Table 1), each of which are divided again into 3 subgroups. Each subgroup contains 5 teeth, except the Group E which contained 15 teeth which were not subjected to any cavity preparations and restorations and were evaluated as control group.

Standardized Class V cavities were prepared 2mm below the Cemento-enamel junction in the enamel in 60 teeth. The cavity margins were beveled with fine grit flame shaped diamond burs.

Group A which contains 3 subgroups I, V, IX, were restored with composite resin

[Z-100 3M]. Group B which contains subgroups II, VI, X were restored with poly acid modified composite resin [Dyract - Densply Asia]. Group C which contains subgroups III, VII, XI were restored with glass ionomer cement [Fuji VIII-GC] and Group D which contains subgroups IV, VIII, XII were restored with glass ionomer cement [Fuji IX GP-GC] in accordance with the manufacturer's instructions.

After setting, the restorations were finished with sofex disc and stored in distilled water and teeth were subjected to thermo cycling by placing them alternatively in a water bath at 55 + 2°C and 0 + 5°C Each cycles consisted of submerging the samples for 30 seconds in thermal bath, withdrawing them for 20 seconds and then submerging them into a beaker with ice placed in a thermocol box for

another 30 seconds.

The roots of all teeth were severed 3mm apical to Cemento-enamel junction, and the pulpal tissues were removed with a no.2 round bur, and then washed with distilled water. 2M 100 ml sodium acetate buffer solutions were prepared and 25 l was placed into pulp chamber of each tooth. The vestibular crown surfaces of teeth in subgroups I, II, III, IV were immersed in 10% Carbamide Peroxide gel [Opalescence Ultradent Products Inc USA], subgroups V, VI, VII, VIII were immersed in commercially available 20% Carbamide Peroxide gel [Opalescence Ultradent Products Inc USA] and subgroups IX, X, XI, XII were immersed in 35% Carbamide peroxide [Opalescence Quick Ultradent Products Inc USA] Group XIII was exposed only to distilled water.

The sodium acetate buffer in the pulp chamber of each tooth was removed after 30 minutes by micro pipettes and transferred to a glass vial. The pulp chamber of each tooth was rinsed twice with 100 micro liters distilled water that was placed in the same glass vial and it was then diluted to total of 3ml with distilled water.

100 micro liters 0.5mg/ml leuco crystal violet (Sigma Aldrich, Germany) and 50 micro liters of 1mg/ml enzyme horse radish peroxidase (Sigma Aldrich, Germany) were added to each vial. The procedure was repeated for each tooth.

The optical density of the blue colour in the vials was measured by visible Spectrophotometer, at the wave-length of 596 nm. The results of the measurements were evaluated statistically using Kruskal-Wallis Test and Mann-Whitney U Test

RESULTS

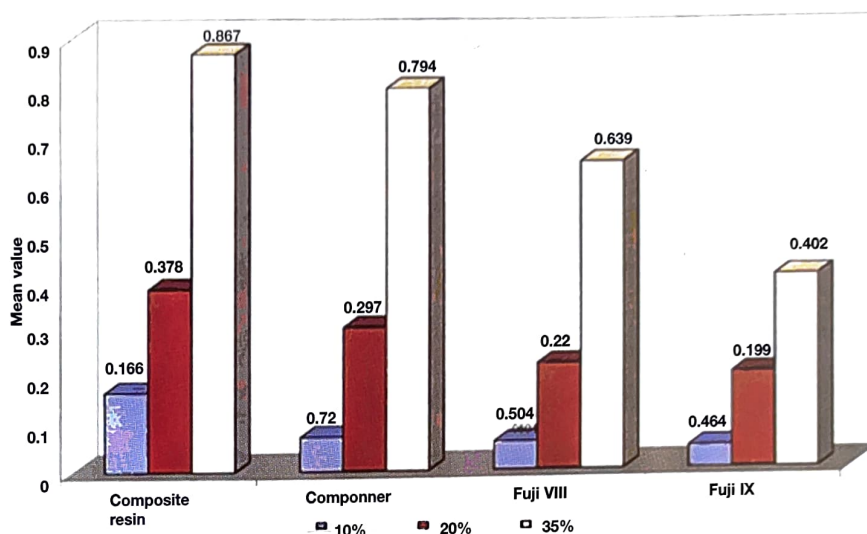
Statistical results

Spectrophotometric analysis was done to analyse the optical density of the solution containing hydrogen peroxide. The statistical analysis was done by Mann-Whitney test and Kruskal-Wallis test.

DISCUSSION

Restorative dentistry is focussing a great

Comparison of mean microleakage in different groups



deal more on cosmetic application among which bleaching of stained vital teeth is becoming more popular. Hydrogen peroxide, in various concentrations, is the primary material currently used by the profession in the bleaching process⁵.

In this study carbamide peroxide gel, of various concentration in the percentage of 10%, 20% and 35% were used. 10%, 20% and 35% carbamide peroxide contains 3%, 6-8% and 10-12% free hydrogen peroxide respectively.

In this ex vivo study, the pulpal penetration of various concentrations of carbamide peroxide gel using 4 different restorative materials was evaluated.

The restorative materials used in this study were composite resin (Z 100), compomer (Dyract AP); Glass ionomer cements namely Fuji VIII and Fuji IX. Z 100 with single bond (3M) dental adhesive system. It is a visible light activated radioopaque restorative composite with zirconia / silica as filler. It contains BIS-GMA and TEG DMA resins.

The results of this investigation were statistically analysed and it indicated that there was some definite effect of the bleaching agent utilized; when the same came into contact with the various restorative materials.

When carbamide peroxide of different

concentrations of 10%, 20% and 35% was applied on the tooth surface it showed that pulpal penetration was the least with Fuji IX restorative material followed by Fuji VIII, Dyract AP and Z 100 in an ascending manner.

Concentration of the bleaching agent when increased from 10% to 35% there was a significant increase in pulpal penetration of the bleaching agent with all the restorative materials. This result is in agreement with the result of Osman Gokay et al, Bowels et al, Cooper et al.

When a 10% carbamide peroxide gel was used and an inter group comparison made, composite resin showed a significant pulpal penetration difference to that of compomer, highly significant to that of Fuji IX and that of Fuji VIII. Likewise compomer showed no significant pulpal penetration difference to that of Fuji VIII and significant response to Fuji IX. When Fuji VIII and Fuji IX were compared there was no significant difference.

When 20% carbamide peroxide gel was used, an inter group comparison was made. Composite resin showed no significant pulpal penetration difference to that of compomer but was highly significant to that of Fuji VIII and Fuji IX. Likewise compomer showed high significance to that of Fuji IX and Fuji VIII. Pulpal penetration differences were sig-

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nificant when Fuji VIII and Fuji IX were compared.

When 35% carbamide peroxide gel was used, composite resin showed no significant pulpal penetration difference to that of compomer and FujiVIII, but highly significant to that of Fuji IX. Likewise compomer showed high significance to that of Fuji IX and Fuji VIII. Moreover pulpal penetration differences were highly significant between Fuji VIII and Fuji IX.

SUMMARY AND CONCLUSION

Studies have shown that microleakage is a serious clinical problem that requires thorough analysis and discussion because all restorative materials in current use exhibit varying degree of marginal leakage.

When a bleaching agent is applied to a restored tooth, the properties of the restorative materials on the tooth may be affected by the bleaching agents.

According to the findings and within the limitation of the study it can be concluded that

1) Teeth restored with Fuji IX showed the least pulpal penetration with all the concentration of carbamide peroxide.

2) Of all the restorative materials composite showed the maximum pulpal penetration with all the concentration of carbamide peroxide.

3) When the percentage of concentration of carbamide peroxide gel increased from 10% to 35% , there was an increase in microleakage regardless of restorative materials used.

4) When 10% carbamide peroxide was used and an intergroup comparison made, composite showed a highly significant difference in microleakage with Fuji VIII and Fuji IX, a significant difference in microleakage with compomer. Compomer showed a significant difference in microleakage with Fuji IX.

5) When 20% carbamide peroxide was used and an inter group comparison made, both composite and compomer showed a highly significant difference in microleakage with Fuji VIII and Fuji IX. A significant difference in microleakage was obtained when Fuji VIII and Fuji IX were compared.

6) When 35% carbamide peroxide was used and an inter group comparison made, composite showed a highly significant difference in microleakage with Fuji XI. Compomer showed a highly significant difference in microleakage with Fuji IX and Fuji VIII. A highly significant difference in microleakage was obtained when Fuji VIII and Fuji IX were compared.

Dr. Noushad MC. MDS, Reader.

Dr (Prof) C.V.Pradeep MDS Head of the dept; Department of Conservative Dentistry & Endodontics; Mahe Institute of Dental Sciences & Hospitals, Mahe, U.T. of Puducherry, Mahe Institute of Dental Sciences & Hospitals, Mahe, U.T. of Puducherry.

Dr Subin Barath MDS Registrar MOH Kuwait