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Comparative evaluation of different aesthetic procedures on colour change, stability and postoperative sensitivity-An Invivo Study.

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Abstract

Aim of the study: This study was conducted to evaluate and compare the color change, color stability and post operative sensitivity of teeth in patients subjected to different esthetic techniques.

Materials and methods:15 patients were selected in total and divided into 3 equal groups (n = 5) randomly. Esthetic procedures were carried out in three groups: Group I-mcinnes bleaching solution, Group II- Antivet bleaching solution, Group III-Resin infiltration; according to the manufacturer's instructions. VITA classic shade guide was used to determine color change before and after bleaching procedures. Color stability was evaluated; at baseline, after 1 week, after 1 month, and after 3 months of treatment using the VITA shade guide. To evaluate tooth sensitivity A VAS questionnaire was used before the treatment and immediately after treatment and after 1 week of treatment.

The null hypothesis was that, there was no difference in the color change, stability, and post operative sensitivity between all three groups at given time interval. The recorded data were tabulated, and statistically analysed. Statistical analysis was performed with the IBM SPSS Statistics Version 20.

Results: All groups showed effective shade reduction, the different tested procedures showed equal color stability (in terms of statistical difference); all three groups presented a similar degree of post-operative sensitivity which diminished at the 7 days follow-up.

Keywords: Antivet Bleaching Solution, Color Stability, Color Change, Mcinnes Bleaching Solution, Postoperative Sensitivity, Resin Infiltration.

Introduction

Tooth whitening can be considered as easier, faster and minimally invasive treatments and the option choice for those desiring brighter teeth, in a cheaper way when compared to other restorative esthetic techniques.

Tooth discoloration can be due to extrinsic or intrinsic stains [1].

Dental fluorosis is most common intrinsic tooth discoloration in which enamel is affected. This discoloration is caused by excessive intake of fluorides effecting ameloblasts during enamel formation[2].

There are different treatment approaches for tooth discoloration ranging from whitening toothpaste, scaling and polishing to remove surface stains to micro abrasion and macro-abrasion[3,4,5].

Bleaching has been considered as a simple, easy, most effective and well accepted method for treating discoloured teeth[6]. Among the non-invasive methods, bleaching with mc innes has been recognized as the least invasive approach and has been successfully used in adolescents for tooth discoloration.

A newer material, bleaching with Antivet is a one-visit treatment for treating stains, mainly caused by fluorosis and extrinsic stains.

"in addition to these, resin infiltration, a technique originally advocated for arresting early caries and for esthetic management of white opacities associated with early caries, have also been reported to treat fluorosis stains" [7,8]. The reason for using in fluorosis stains is that, mild fluorotic lesions mimic white spot demineralization.

Recent studies states that Antivet and resin infiltration techniques has 'good' to 'excellent' esthetic changes with in mild to moderate fluorosis stains**,** however to the best of our knowledge no clinical trial has conducted comparing the esthetic changes as achieved by Antivet and Resin infiltration with the most conventional mcinnes bleaching procedure.

Thus, this study was conducted to evaluate and compare different esthetic procedures on color change, stability and postoperative sensitivity.

Materials and methods

Three esthetic procedures were done using three different materials. The product name, composition is listed below:

Group	Product	Composition
1	Mcinnes solution	5 parts hydrochloric acid (36%) 5 parts hydrogen peroxide (30%) 1 part anaesthetic ether
2	Antivet solution	Acid base (antivet): Hydrofluoric acid at a 21% conc. Alkaline base (neutralizer): Calcium hydroxide with a ph >12
3	Resin infiltration kit (icon dmg, Germany)	Contains 3 syringes, 15% hydrochloric acid gel (icon etch), Ethanol-drying agent (icon dry), and Resin infiltrant (icon infiltrant).

Patient selection

Approval from the institutional ethical committee was obtained

15 patients of age group 18-40 were selected for this study. The selection of patients was done based on inclusion and exclusion criteria**.**

Inclusion criteria

Only teeth with dental fluorosis score 2 and 3 (deans classification of dental fluorosis 1942), the subjects available for the duration of the treatment were included for this study.

Exclusion criteria

History of allergy, fractured maxillary incisors, class v carious lesions, habit of smoking, pregnant or lactating woman, cracks or crazing present in the enamel and teeth with hypersensitivity.

Case recording

After selection of patients, clinical dental examination was done. The written consent form was taken from the patients after a detailed explanation of the procedures. Then the subjects were divided into three equal groups randomly, five patients in each group based on esthetic technique performed.

First group: **mcinnes bleaching;** (n=5)

Second group: **Antivet solution**; (n=5)

Third group: **resin infiltration technique** ;(n=5).

Baseline colour determination

Prior to the procedures, a vita classic shade guide (vita Zahn Fabrik, Germany) was used for colour determination. Shade calibration was done using a vita shade guide before shade determination.

"In shade guide tabs were arranged from b1 to c4, corresponding to a grade of whitening from 1 to 16" [9].

Table 1: *VITA Shade Guide With 16 Shades Ranked From the Lightest Color on the Left to the Darkest Color on the Right*

B1	A1	B2	D2	A2	C1	C2	D4	A3	D3	B3	A3,5	B4	C3	A4	C4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

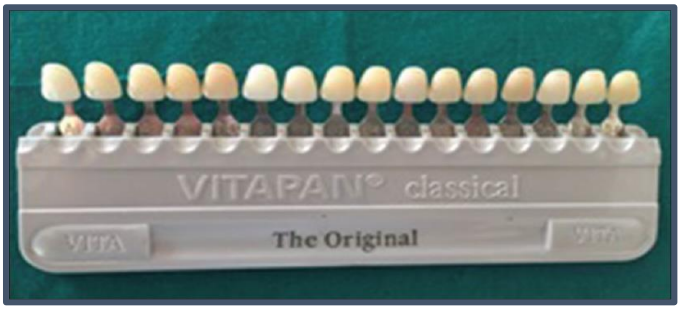


Fig. 1: VITA classic shade guide

Shade evaluation

The shade evaluation was repeated for three times to ensure readings to be accurate, and to avoid deviations.

An average of these readings was taken.

Treatment protocols for different aesthetic procedures

Group 1: treatment with mcinnes solution

Preoperative photographs were taken before the procedure. Teeth were isolated using rubber dam.

The Mc Innes solution has 5 parts of 35% of hydrogen peroxide, 5 parts of hydrochloric acid 36% and 1 part of ether.

Mcinnes solution was prepared just prior to the procedure, for the effectiveness of the solution and solution was applied on to the teeth using cotton buds for 5-10 minutes with intervals. The procedure was repeated until the stain disappeared.

Fig. 2: Mcinnes Solution

Group 2: Treatment with Antivet solution

Isolation with rubber dam was done and 5 drops of Antivet was placed in the plastic well that comes with the kit.

ANTIVET solution was applied over the tooth's surface

using a well condensed cotton pellet in a sweeping motion from cervical to incisal.

Once the tooth surface is free of stains, a dry cotton pellet or gauze is used to remove any excess solution on the enamel. In a separate mixing well, Neutralising Solution is taken and applied onto the tooth surface using a brush and left for 2 minutes.

Fig.3: Bleaching with Antivet

Group 3: Treatment with resin infiltration

After isolation with rubber dam, 15% hcl gel (ICON Etch) was applied for 2 min, then the etching gel was washed away with water spray for 30 seconds. After ICON Etch, ethanol (ICON Dry) was applied. Then the tooth was checked for improvement in opacity and if the homogeneity in shade was not seen; etching was repeated.

Low viscosity resin infiltrant (ICON Infiltrant) was applied, and then left for 3 min to allow penetration deep into the lesion. After 3 min, the excess resin was wiped away with cotton rolls and dental floss and finally light cure polymerization was done for 40 seconds. The infiltrant was again applied for 1 more minute followed by light cure polymerization for 40 s.

Fig. 4: Resin infiltration technique

Evaluation of colour

Color stability was evaluated was at first day, after one week, after one month and after 3 months of the treatment.

Evaluation of hypersensitivity

Qualitative values were recorded using a visual analog scale (VAS).

These values correspond to no pain, mild, moderate, and severe pain.

Hypersensitivity was evaluated before the treatment, immediately following treatment and after 1 week of treatment. As measurement of hypersensitivity was subjective; subjects were asked to rate the hypersensitivity according to the degree of severity.

Statistical analysis

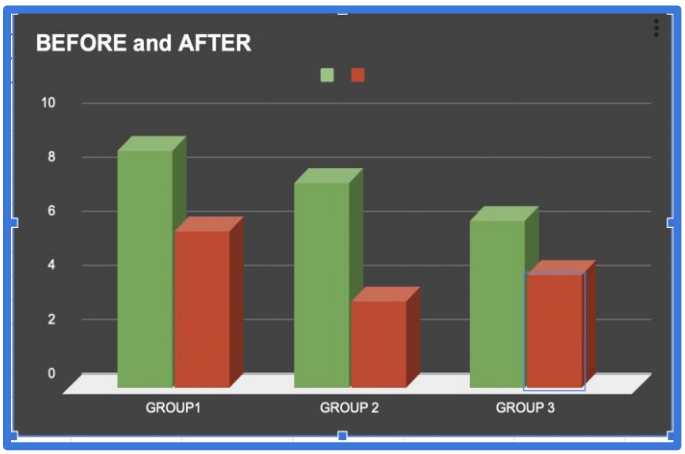
The recorded data were tabulated and statistically analysed. IBM SPSS Statistics Version 20 was used for statistical analysis.

As the sample size is small, the significance level was set to $P \leq 0.05$.

The VAS scores data showed non-parametric (non-normal) distribution. The data were presented as mean, median, standard deviation (SD), and 95% confidence interval (CI) for the mean values.

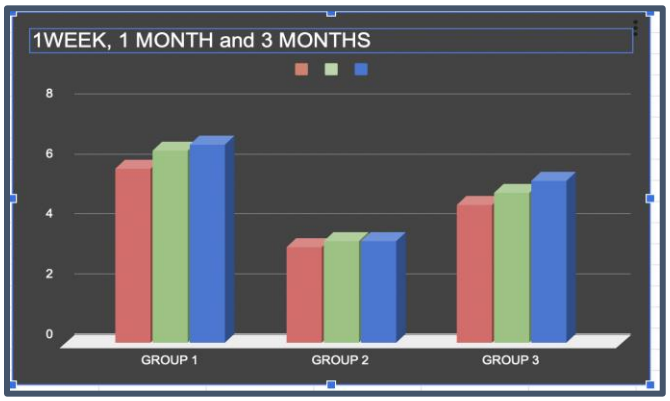
Results

Results for colour change



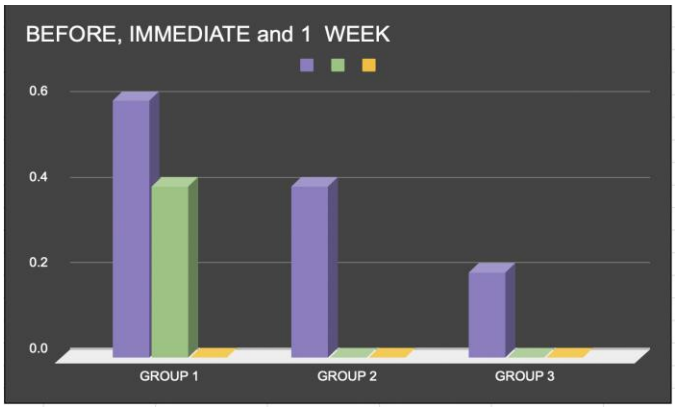
		N	Mean	Std. Deviation
Color change before	1	5	8.80	3.194
	2	5	7.60	2.510
	3	5	6.20	1.924
	Total	15	7.53	2.642
Color change after	1	5	5.80	1.924
	2	5	3.20	1.095
	3	5	4.20	1.304
	Total	15	4.40	1.765

Results for colour stability



		N	Mean	Std. Deviation
CS 1 Week	1	5	5.80	1.924
	2	5	3.20	1.095
	3	5	4.60	1.517
	Total	15	4.53	1.807
CS 1 Month	1	5	6.40	1.517
	2	5	3.40	.894
	3	5	5.00	1.414
	Total	15	4.93	1.751
CS 3 Months	1	5	6.60	1.817
	2	5	3.40	.894
	3	5	5.40	1.140
	Total	15	5.13	1.846

Results of post-operative sensitivity



		N	Mean	Std. Deviation
Before	1	5	.60	.548
	2	5	.40	.548
	3	5	.20	.447
	Total	15	.40	.507
After	1	5	.40	.548
	2	5	.00	.000
	3	5	.00	.000
	Total	15	.13	.352
After 1 Week	1	5	.00	.000
	2	5	.00	.000
	3	5	.00	.000
	Total	15	.00	.000

Discussion

Mild-to-moderate fluorosis is an unsightly disorder involving phase enamel, where its surface layers are affected, and the main objective while treating such aesthetically objectionable fluorotic lesions would be to

preserve the tooth structure while simultaneously achieving a reasonably acceptable cosmetic result[10].

Dean's fluorosis index (1942), is the gold standard in classifying the varying degrees of severity of dental fluorosis. Six scores are given according to their clinical signs.

0 for normal or unaffected teeth which have a smooth, uniform, creamy white surface, 0.5 for teeth that are questionable and have some white flecks or spots ,1 for very mild <25% of the tooth is covered with small white opaque areas, 2 for mild where no more than 50% with white opaque areas, 3 for moderate where more than 50% of the entire tooth surface is affected and may have and brown staining, and 4 for teeth that are severely corroded or pitted and often have brown staining affecting 100% of the enamel surface[2].

Bleaching with mcinne's solution for fluorosis stains has been proven to be easy, fast, and effective.

Bleaching by using Antivet solution is formulated to eliminate stains on the enamel surface caused by dental fluorosis or any other external factor with an advantage of little or no intraoperative and postoperative sensitivity.

Resin infiltration is another alternative approach for treating fluorotic lesions. In this technique, microporosities of lesions are occluded by infiltration with low-viscosity light-curing resins.

Endemic conditions like fluorosis require treatment options that are simple, efficient, and time-saving. There is a need for subjective and objective assessment, which among the available treatment options are most efficient with regard to showing maximal aesthetic improvements and at present, the available literature shows a dire scarcity with this regard [11,12].

Hence, in this study, we intend to evaluate and compare different esthetic procedures on color change, stability and postoperative sensitivity.

Change in tooth color can be determined by means of a visual inspection using a color shade guide, which is a subjective method. This method of evaluation is said to be very functional, easy and fast to use [13].

Other than subjective methods, Objective methods can be employed. They include use of a spectrophotometer, colorimeters and software images.

On comparison of spectrophotometer data and shade guide data. It was revealed that existing shade guides are useful for measuring color change which occurs with bleaching.

Literature supports the use of shade guides as an effective instrument in determination of color change[14].

In addition, shade guides provide information that is clinically meaningful to both dentists and patients. Electronic colour measurement, by contrast, may have the ability to measure more accurately. In fact, they have ability to detect color differences that are not important clinically. "Since shade guide determination is made by the human eye and the eye is the arbiter of what constitutes a clinically important change, shade guides should continue to have a vital role in measuring the change in tooth color associated with tooth bleaching "[14].

So, for this study the color determination was done using a VITA classic shade guide (VITA Zahn Fabrik, Germany).

Post operative sensitivity is a subjective variable and can differ from one patient to another, leading to personal variability. This variability is dependent on many factors like pain threshold, age, enamel and dentin thickness, the variation of diffusivity of the bleaching agent, and PH[3].

Conclusion

Within the limitations of the study, the following conclusions were obtained

1. In a follow-up period of 3 months, the different

tested procedures showed equal color stability (in terms of statistical difference);

2. The different tested techniques showed a similar clinical efficiency in color change and degree of post-operative sensitivity;
3. In all the tested techniques, sensitivity diminished on 7 days follow-up.

As per the statistical analysis, the null hypothesis was accepted in terms of color change, stability and post-operative sensitivity.

Clinical significance

Since all the three tested procedures showed colour change and stability, Antivet solution and resin infiltration methods can be considered as potential alternative therapeutic approaches for treating mild to moderate fluorotic lesions.

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