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Research Article

**COMPARISON OF ENAMEL MICROABRASION WITH A
COMBINED APPROACH TO THE ESTHETIC
MANAGEMENT OF FLUOROSSED TEETH****¹Dr Maryem Muneer Awan, ²Dr Shaista Zahid, ³Dr Naila Aman**¹Demonstrator IIDC, Islamabad, ²Sharif Medical and Dental College, Lahore, ³Resident FCPS Punjab Dental Hospital, Lahore.**Article Received:** February 2019**Accepted:** March 2019**Published:** April 2019**Abstract:**

The long-term clinical performance of combined therapy including enamel micro-abrasion and vital bleaching is debatable due to the abrasion of outer enamel surface. The aim of this longitudinal cohort study was to evaluate the 3-year clinical performance of enamel micro-abrasion in combination with vital tooth bleaching for the esthetic management of fluorosed teeth.

Fifteen patients with 176 flourished incisors and canines were included in this study. All the teeth were treated with enamel micro-abrasion (Opalustre, Ultradent), and at-home bleaching technique (10% Opalescence PF, Ultradent). Fluorosed teeth were evaluated at baseline, after micro-abrasion, after combined therapy, and at 3-year follow-up in terms of esthetical criteria (esthetical appearance, brown stains, and opaque white areas), side effects, and patient satisfaction using visual analogue scales. The data were statistically analysed ($\alpha = 0.05$). Results: Flourished teeth revealed significantly better esthetical appearance after micro-abrasion and combined therapy and at 3-year follow-up compared to those at baseline ($P < 0.05$). There was a significant relapse in the esthetical appearance and brown stains at 3-year follow-up ($P < 0.05$).

The combined therapy was effective in the esthetical management of flourished teeth. However, a significant relapse was observed in the esthetical appearance and brown stains of these patients after 3 years, which also reduced patient satisfaction.

Keywords: *Clinical trial, dental fluorosis, enamel micro-abrasion, relapses in bleaching, vital bleaching.*

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INTRODUCTION:

Dental fluorosis accompanied by white opaque areas, brown stains, or porosities on the enamel surface leads to mild to severe esthetic problems requiring esthetic treatment. Many treatment modalities have been proposed for the esthetic management of dental fluorosis, ranging from bleaching techniques such as enamel micro-abrasion, vital bleaching, or a combination of both, to restorative approaches such involving the use of composite or ceramic veneer or crowns. The treatment choice depends on the severity of dental fluorosis. In flourished teeth, opaque white areas formed due to the demineralization of enamel while brown stains occurred because of the discoloration of these demineralized areas. Enamel micro-abrasion and vital bleaching produced successful results in improving clinical appearance of mild cases with opaque white areas. But in moderate and severe cases, the most popular conservative technique is the combination of enamel micro-abrasion and vital bleaching. Where severe dental fluorosis with deep enamel defects is present, the treatment will involve restorative techniques.

Enamel micro-abrasion, which is performed by applying a hydrochloride acid (HCl) gel, removes the porous subsurface of the enamel layer together with entrapped stains. Since then, numerous case reports and a few clinical trials have been published about the clinical performance of this technique in flourished teeth. However, this technique has some disadvantages which limit its application alone. The first one is that it is difficult to remove a deep opaque white area or brown stain from the tooth completely by this technique. They often are improved, but they cannot always be eliminated. The other disadvantage of this technique is that teeth will have a slightly yellowish colour after enamel micro-abrasion because this process decreases the enamel thickness and furthermore the appearance of the tooth is generally not uniform after the treatment.

Vital bleaching has been rarely preferred in the treatment of dental fluorosis alone. In the literature, this technique was only employed in the mild cases with opaque white areas. The main use of this technique is in combination with enamel micro-abrasion to whiten the micro-abraded teeth and to improve the uniform appearance. This combined therapy including enamel micro-abrasion followed by vital bleaching was reported to be effective in the esthetical management of mild to severe flourished teeth.

In literature, there are limited data on the long-term performance of different techniques used for the management of dental fluorosis. Enamel micro-abrasion removes approximately 10–200 μm of the outer enamel layer, depending on the pressure and number of applications, HCl acid concentration, and abrasive particles. The bleaching process causes alterations on the enamel surface depending on the concentration of the gel used. The variety of alterations that may result from enamel micro-abrasion and vital bleaching techniques increase the concerns about the long-term clinical performance of this combined approach. Although the successful long-term results were reported after 2–23 years follow-ups of the enamel micro-abrasion technique in two case reports, there is a lack of longitudinal clinical trial evaluating the long-term performance of the combined approach. The aim of this longitudinal cohort study was to evaluate the 3-year clinical performance of enamel micro-abrasion in combination with vital tooth bleaching for the esthetic management of fluorosed teeth. The correlation between the relapse in esthetic criteria at follow-up and severity of fluorosis, demographic factors, oral hygiene, and diet variables was also assessed. The null hypothesis tested was that there is no difference among the esthetic criteria recorded at baseline, after enamel micro-abrasion, after combined therapy, and at 3-year follow-up.

METHODS:

The Design of the Study

This was a longitudinal cohort study which was performed with a high concentration of fluoride in drinking water. Fifteen patients of Punjab Dental Hospital, Lahore were treated between December 2017 and May 2018. Enamel micro-abrasion and at-home bleaching therapy were consecutively performed on all patients. The fluorosed teeth were assessed in terms of various criteria regarding esthetics and side effects at different evaluation periods:

- (a) Baseline,
- (b) After enamel microabrasion,
- (c) After combined therapy (enamel microabrasion and at-home bleaching), and
- (d) 3-year follow-up

Size of the Study

The study size was determined with the PASS Sample Size Software. At least 154 teeth were required to determine the $F = 0.30$ effect difference between the study groups with 95% power and an alpha error of 5%. Due to the long follow-up period, 176 fluorosed teeth, including an additional 20% of

the number of teeth required, were included in the study. Twenty patients were assessed for the eligibility, but five patients were excluded due to smoking or poor dental health.

Study Participants

The participants were selected from the patients referred to the university clinic for the management of fluorosed teeth. Fifteen patients (eight male and seven female), with a mean age of 27 years (range: 18–45 years) were enrolled in this longitudinal cohort study.

Inclusion criteria

- Minimum of eight vital fluorosed incisors and canines with scores of 1–4, according to Dean's Fluorosis Index (DFI) (0 - normal, 0.5 - questionable, 1 - very mild, 2 - mild 3 - moderate, and 4 - severe)
- No caries or restoration on the teeth to be treated

- Return for follow-up.
- Exclusion criteria*
- Poor general or dental health
 - Smoking
 - Hypersensitive teeth
 - Previous use of bleaching agents
 - Pregnant or lactating
 - Any fixed orthodontic appliances
 - A history of allergies to bleaching agents
 - Age of <18 Years

Measurement

Once patients enrolled into the study, they completed a questionnaire assessing their medical history, oral hygiene habits (frequency of tooth brushing), and diet (frequency of discolouring drink consumption and frequency of acidic drink consumption). The baseline demographics, clinical characteristics, and oral hygiene and diet habits of the patients are presented in Table 1.

Table 1: The baseline demographic, clinical characteristics, oral hygiene, and diet habits of patients

	Patients' Number	Number of Teeth (%)
Gender		
Male	8	95 (54)
Female	7	81 (46)
Age (year)		
18-30	10	118 (67)
31-40	2	24 (14)
40-50	3	34 (19)
Oral Hygiene		
Moderate	4	48 (27)
Good	11	128 (73)
Severity of fluorosis		
Very Mild	4	9 (5)
Mild	8	43 (24)
Moderate	14	95(54)
Severe	7	29(17)
Frequency of tooth brushing		
<once a day	-	-
Once a day	6	70(40)
Twice a day	6	72(41)
>Twice a day	3	34(19)
Frequency of Discolouring Drink Consumption		
>5 times each day	8	95(54)
3-4 times each day	3	36(20)
1-2 times each day	3	33(19)
<once a day	1	12(7)
Frequency of acidic Drink Consumption >5 times each day		
>5 times each day	-	-
3-4 times each day	2	24(14)
1-2 times each day	2	23(13)
<once a day	13	129(73)

RESULTS:

Fourteen of 15 patients returned for follow-up so that 164 of 176 teeth were re-evaluated, and the recall rate was 93%. One patient with 12 fluorosed teeth could not be re-evaluated as he moved to another city. The test of intra- and inter-examiner agreement resulted in a Cohen's kappa statistic of 0.79 and 0.82, respectively.

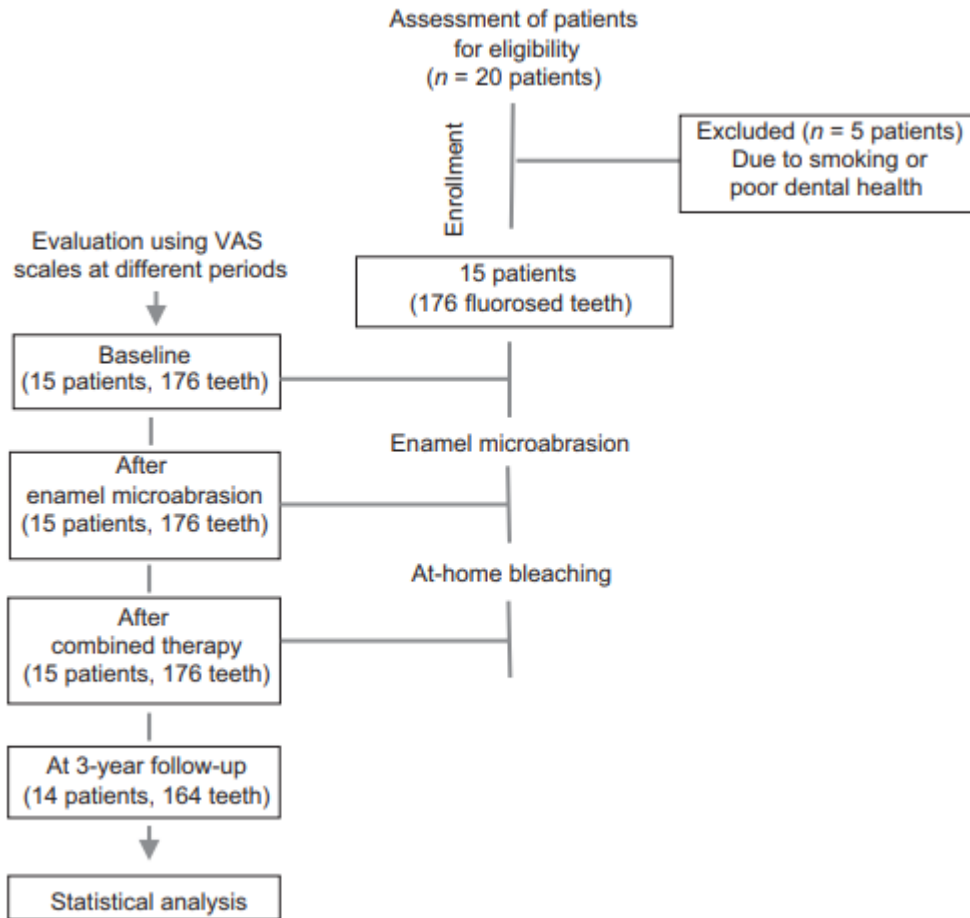


Figure 1: The flow chart of the study protocol

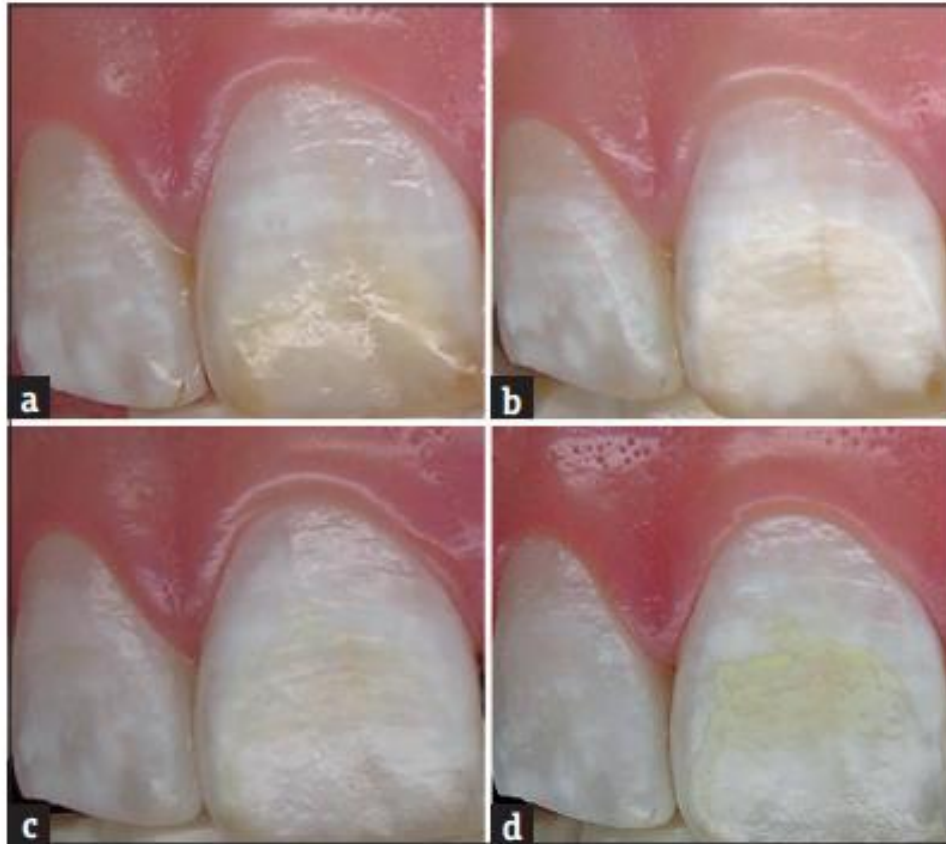


Figure 2: Baseline and post treatment views of fluorosed teeth managed by the combined approach; (a) baseline, (b) after micro-abrasion, (c) after vital bleaching, and (d) after 3 years. A slight relapse like a yellowish stain on the buccal surface existed on the maxillary incisor at 3-year follow-up.

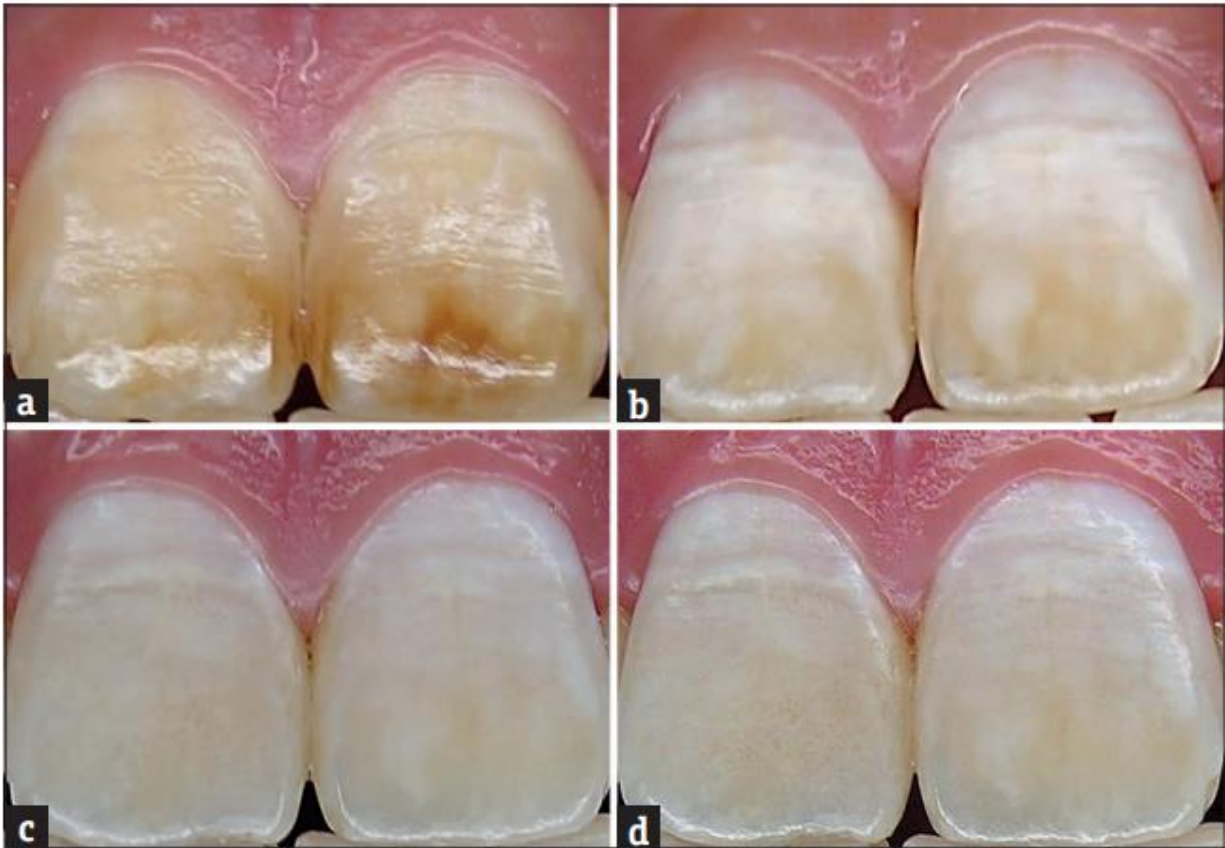


Figure 3: Baseline and post treatment views of fluorosed teeth managed by the combined approach; (a) baseline, (b) after micro-abrasion, (c) after vital bleaching, and (d) after 3 years. There was an evident discoloration on the whole surfaces of maxillary incisors at 3-year follow-up.

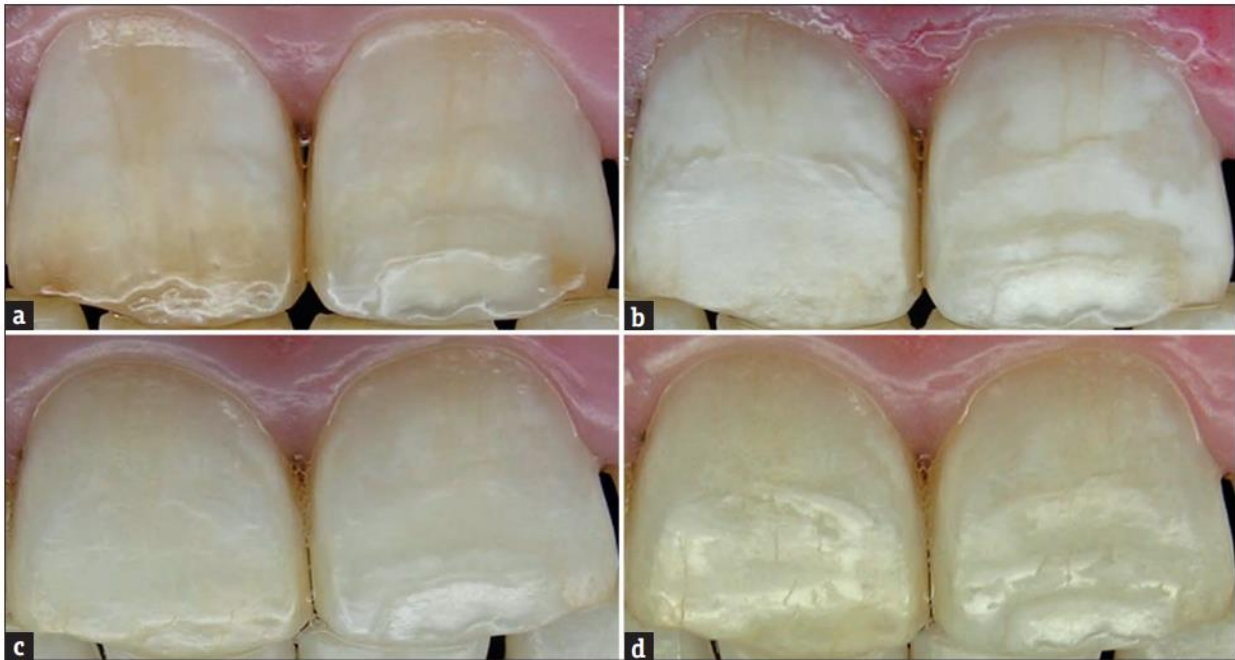


Figure 4: Baseline and post treatment views of fluorosed teeth managed by the combined approach; (a) baseline, (b) after micro-abrasion, (c) after vital bleaching, (d) after 3 years. There was no relapse in the esthetic appearance of these maxillary incisors at 3-year follow-up.

There were significant differences in the esthetic appearance of fluorosed teeth and in the brown stains and opaque white areas on fluorosed teeth at different evaluation periods ($P = 0.000$). Fluorosed teeth revealed a significantly better esthetic appearance and significant reduction in VAS scores of brown stains after micro-abrasion, after combined therapy, and at 3-year follow-up compared to those at baseline ($P < 0.05$). However, they displayed a significant reduction in white opaque areas just after combined therapy and at 3-year follow-up when compared with those at baseline ($P < 0.05$).

After microabrasion, the scores for the esthetic appearance and for the brown stains and white opaque areas were significantly lower than those after combined therapy and at 3-year follow-up ($P < 0.05$). The best esthetic appearance and the least pronounced brown stains were recorded after combined therapy ($P < 0.05$). There was a significant relapse in the esthetic appearance and in the brown stains at 3-year follow-up when compared to those after combined therapy ($P < 0.05$).

Nevertheless, no significant differences were noted between the VAS scores for the white opaque areas which were recorded after combined therapy and at 3-year follow-up ($P > 0.05$).

Tooth sensitivity, gingival problems, and patient satisfaction

All patients reported no tooth sensitivity or gingival problems at baseline and at 3-year follow-up. Tooth sensitivity and gingival problem levels of patients after micro-abrasion and after combined therapy were slight, and there were no significant differences between these scores. They were also significantly higher compared to the baseline and follow-up scores ($P < 0.05$). Patient satisfaction was “slight” at baseline, “moderate” after micro-abrasion and at follow-up, and “very satisfied” after combined therapy. Patient satisfaction level was the lowest at baseline and the highest after combined therapy ($P < 0.05$). At 3-year follow-up, satisfaction was significantly lower than that after combined therapy ($P < 0.05$). However, satisfaction was similar after micro-abrasion and at 3-year follow-up.

DISCUSSION:

The null hypothesis was rejected. In the esthetic management of fluorosed teeth, the combined therapy including the enamel micro-abrasion followed by vital tooth bleaching was found effective. But a significant relapse was occurred in the esthetic appearance and brown stains of the patients subjected to the combined therapy after 3 years. In the present study, enamel micro-abrasion in combination with vital tooth bleaching for the management of tooth discoloration caused by fluorosis was evaluated in terms of esthetic criteria, side effects, and patient satisfaction using VAS scales. The implementation of enamel micro-abrasion alone or in combination with vital bleaching procedures is a commonly used and effective method for removal of fluorotic stains on tooth surfaces. Enamel micro-abrasion alone was satisfactory in most of the mild fluorosis cases, but when the severity of fluorosis increased, more satisfactory results were reported with the combined approach.

In this study, first enamel micro-abrasion then vital bleaching are employed. The reason for this sequence was that enamel micro-abrasion causes a micro-reduction on the enamel surface, and, in some cases, teeth submitted to micro-abrasion may appear a darker or yellowish colour because the thin remaining enamel surface can reveal some of the dentinal tissue colour. Vital bleaching procedure eliminates this colour change due to enamel micro-abrasion. For enamel micro-abrasion, a well-known product including 6.6% hydrochloric acid and silicon carbide micro-particles was used. A bleaching agent with 10% carbamide peroxide was preferred for at-home bleaching.

In this study, modifications of visual scales used in previous articles on the management of dental fluorosis were preferred. VAS is still the most common approach used to assess the effectiveness of dental fluorosis treatments, even though it is a subjective technique. This is because a detectable colour change in fluorotic areas based on CIELAB system is not enough in fluorosed teeth, as the main targets are to remove all fluorotic stains and to improve the mottled surface.

The long-term success of bleaching therapy is as important as its immediate success. Several studies evaluating the long-term efficacy of bleaching agents on physiological discolorations have reported a varying degree of bleaching relapse over time. However, there is limited information on the long-term success of bleaching techniques used for the esthetic management of fluorosed teeth.

The findings of this study are very important because there is no long-term prospective clinical trial on the management of fluorosed teeth. However, there are some limitations of this study. One of the limitations was to use VAS, a subjective scale for assessing the performance of combined therapy because there is no good objective method to evaluate the removal of fluorotic stains. The other limitation was the evaluation periods. The patients were evaluated at baseline and at 3 years depending on the previous researches which also performed evaluations at two time periods. However, annual evaluation periods may also show exact relapse time.

In the present study, enamel micro-abrasion significantly improved the esthetic appearance and significantly reduced the brown stains compared to baseline, but it could not sufficiently eliminate the opaque white areas. In addition, better results were observed after combined therapy compared to those obtained after enamel micro-abrasion for all esthetic criteria. Previous articles also reported that the combination of enamel micro-abrasion and vital bleaching techniques resulted in better performance in all esthetic criteria compared to the technique in which the enamel micro-abrasion was employed alone.

The reason for the relapse in the present study may be explained by three facts:

(a) The structural and permeability changes, and surface porosity in the enamel surface caused by enamel micro-abrasion and vital bleaching,
 (b) Prolonged bleaching duration in severe cases, and
 (c) Demographic factors, oral hygiene, and diet variables of the patients. Enamel micro-abrasion removes the outermost layer of enamel and forms a densely compacted prism-free layer on the enamel surface. This method is believed to smooth surface irregularities and results in a more regular, lustrous enamel surface. However, at-home bleaching agents applied after enamel micro-abrasion may produce an irregular surface, and use of bleaching agents for a prolonged period may increase these effects. Likewise, some degree of rebound effect has been observed within days or weeks following the bleaching procedure in many cases in the literature. In the present study, the application duration of at-home bleaching gel was 2.9 weeks, but in severe cases, it was applied up to 4 weeks.

CONCLUSION:

Within the limitations of this study, the following

conclusions can be drawn:

- The null hypothesis was rejected; different results were recorded in all esthetic criteria at different evaluation periods
- The combined therapy was more effective than enamel micro-abrasion in the esthetic management of fluorosed teeth
- A significant relapse was observed in the esthetic appearance and brown stains of patients after 3 years, which also reduced the patient satisfaction
- Gender, severity of fluorosis, and frequency of acidic drink consumption were correlated with the relapse in the esthetic appearance and brown stains after 3 years.

REFERENCES:

1. Robinson PG, Nalweyiso N, Busingye J, Whitworth J. Subjective impacts of dental caries and fluorosis in rural Ugandan children. *Community Dent Health* 2005;22:231-6.
2. Sujak SL, Abdul Kadir R, Dom TN. Esthetic perception and psychosocial impact of developmental enamel defects among Malaysian adolescents. *J Oral Sci* 2004;46:221-6.
3. Celik EU, Yildiz G, Yazkan B. Comparison of enamel microabrasion with a combined approach to the esthetic management of fluorosed teeth. *Oper Dent* 2013;38:E134-43.
4. Celik EU, Yildiz G, Yazkan B. clinical evaluation of enamel microabrasion for the aesthetic management of mild-to-severe dental fluorosis. *J Esthet Restor Dent* 2013;25:422-30.
5. Ng F, Manton DJ. Aesthetic management of severely fluorosed incisors in an adolescent female. *Aust Dent J* 2007;52:243-8.
6. Sundfeld RH, Croll TP, Briso AL, de Alexandre RS, Sundfeld Neto D. Considerations about enamel microabrasion after 18 years. *Am J Dent* 2007;20:67-72.
6. Shanbhag R, Veena R, Nanjannawar G, Patil J, Hugar S, Vagralli H. Use of clinical bleaching with 35% hydrogen peroxide in esthetic improvement of fluorotic human incisors in vivo. *J Contemp Dent Pract* 2013;14:208-16.
7. Castro KS, Ferreira AC, Duarte RM, Sampaio FC, Meireles SS. Acceptability, efficacy and safety of two treatment protocols for dental fluorosis: A randomized clinical trial. *J Dent* 2014;42:938-44.
8. Allen K, Agosta C, Estafan D. Using microabrasive material to remove fluorosis stains. *J Am Dent Assoc* 2004;135:319-23.
9. Lynch CD, McConnell RJ. The use of microabrasion to remove discolored enamel: A

- clinical report. *J Prosthet Dent* 2003;90:417-9.
11. Loyola-Rodriguez JP, Pozos-Guillen Ade J, Hernandez-Hernandez F, Berumen-Maldonado R, Patiño-Marin N. Effectiveness of treatment with carbamide peroxide and hydrogen peroxide in subjects affected by dental fluorosis: A clinical trial. *J Clin Pediatr Dent* 2003;28:63
10. Yildiz G, Celik EU. A minimally invasive technique for the management of severely fluorosed teeth: A two-year follow-up. *Eur J Dent* 2013;7:504-8.
11. Kendell RL. Hydrochloric acid removal of brown fluorosis stains: Clinical and scanning electron micrographic observations. *Quintessence Int* 1989;20:837-9.
12. Azrak B, Callaway A, Kurth P, Willershausen B. Influence of bleaching agents on surface roughness of sound or eroded dental enamel specimens. *J Esthet Restor Dent* 2010;22:391-9.
13. Soares DG, Ribeiro AP, Sacono NT, Loguercio AD, Hebling J, Costa CA. Mineral loss and morphological changes in dental enamel induced by a 16% carbamide peroxide bleaching gel. *Braz Dent J* 2013;24:517-21.
14. Sundfeld RH, Sundfeld-Neto D, Machado LS, Franco LM, Fagundes TC, Briso AL. Microabrasion in tooth enamel discoloration defects: Three cases with long-term follow-ups. *J Appl Oral Sci* 2014;22:347-54.