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Aesthetic Management of Enamel Defects with Microabrasion and Bleaching and their Effectiveness.

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ABSTRACT

Background: To investigate the effectiveness of the microabrasion and bleaching techniques together on the enamel defects for the improvement of the dental aesthetics. **Methods**: Thirty four patients who had Enamel defects affecting the maxillary anterior teeth were selected and the defects were classified as line defects and patch defects. The patient's past medical history, any history of fluoride ingestion were elicited. The affected maxillary anterior teeth were treated with microabrasion paste, (Opalustre) followed by bleaching (opalescence). The aesthetic improvements were assessed by the patients and their level of satisfaction and happiness after the treatment were recorded. **Results**: Happy score was significantly more among Lined pattern when compared to Patched pattern. Statistical test: Chi square test. **Conclusion**: Microabrasion and bleaching technique together are effective in improving the aesthetics of the patients with both type of defects (line defects and patch defects) and are effective conservative management of enamel discolorations.

Keywords: Bleaching, Microabrasion, Fluoride, Tooth Discoloration.

INTRODUCTION

Dental aesthetics is considered as an important element in our beauty oriented society.[1] Intrinsic and extrinsic shades of the teeth determines its colour primarily. Light-scattering and adsorption properties of the enamel and dentin relates to the intrinsic colour. Whereas the absorption of materials contained in cigarettes and tannin-rich foods causes extrinsic stains.[1] Enamel microabrasion technique can remove the irregularities and the discoloration defects of the enamel, hence improving the appearance of the teeth whereas the color of the teeth can be significantly improved by the technique of bleaching. Together these two techniques can do long term wonders in the field of aesthetics. This study presents the effect of both the techniques together over the defective and discolored teeth and the assessment of the effectiveness by the patients themselves.

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As we have less data in the recorded literature for the combined effect of the microabrasion and bleaching so both the procedures were considered important to be correlated with certain major clinical factors.

MATERIALS AND METHODS

Patient selection:
The patients were from the population of Uttarakhand, includes 34 patients of adolescent age group (16 females and 18 males) who reported with the chief complaints of discolored teeth, all the cases were examined carefully, No relevant systemic alterations were eventful. In this study, only those individuals with defects in maxillary anterior teeth and agreed to be treated with microabrasion and bleaching together were included, for the selected patients, the medical histories, previous fluoride intakes were recorded.
All the patients were assessed carefully for the prognosis of the enamel microabrasion followed by bleaching technique and they were taken up for the procedure.

Procedure:
Placement of a rubber dam with the application of a layer of petroleum jelly between the rubber dam and gingival tissue to protect the tissue from the microabrasion product. It is important to protect the patient's, assistants and professional's eyes during this procedure. The microabrasion product,

Opalustre (Ultradent) was pressed against the tooth surfaces using a rubber cup, which was mounted on a standard low-speed contra-angled hand piece to avoid splattering of the product. The compound was carefully applied for 1 minute, in three intervals. Between each interval, the teeth were flushed with water. After completing all three applications, the compound was rinsed off the teeth with a water spray; the teeth were dried and then polished with fluoride paste (Proxyt, ivoclarvivadent). The rubber dam was then removed, and the patient was asked not to ingest solids for 30 minutes. After the microabrasion procedure, tooth bleaching was initiated using a bleaching agent with carbamide peroxide as the active ingredient. In these cases, custom bleaching tray for the maxillary arch was made from alginate impressions. After initial fabrication, the tray was adapted to the patient's oral cavity. Then the patient was instructed to place a small drop of the bleaching product (opalescence) (Ultradent) into each tooth well of the trays. Immediately after placement onto the arch, the patient was to remove the excess product with a toothbrush. The patient was directed to use the tray for 4 hours daily for 4 weeks. After this, the patient was advised to apply topical applications, sodium fluoride gel (septodont) for 1 week for 4 minutes daily. The aesthetic improvements were assessed by the patients and their happiness level after the treatment was recorded.

Assessment of Aesthetics:

The aesthetic improvements were assessed by the patient themselves. They were asked for the assessments immediately after the first course of management and at the 6 months interval.

For immediate assessment, Happy (H) group were those who were satisfied with the appearance and requested for no further management. Unhappy (UH) patients were those who wanted further management in spite of some improvements, Long term Happy Patients (LH) from Happy group who thought the improvements were stable and from Unhappy group (UH) who thought the appearance had improved in the six months and wanted no further management, whereas the long term unhappy (LUH) patients were those Happy group patients who thought the appearance has deteriorated in the next 6 months and preferred further management and those Unhappy group patients who were still unhappy with their appearance. The clinician did not attempt to influence the patient assessments at any point during the procedure.

Classification of enamel Defects: Enamel colour was divided to either yellow or white compared with the normal colour of the enamel. The patterns of opacity were divided in two groups (1) lined appearance and (2) patched appearance.

RESULTS

The analytical relationship between the happiness of the patient and their gender, pattern of opacities, colour of the defect, excessive fluoride intake and long term happiness were tested.

Figure 1: Preoperative Appearance

Figure 2: Microabrasion Technique

Figure 3: After Microabrasion

Figure 4: Postoperative appearance after Bleaching

Figure 5: Preoperative Appearance

Figure 6: Postoperative Appearance

Table 1: Results.

Case	Gender	Pattern	Colour	Excess fluoride	Immediate improvement	Improvement after 6 months
1	M	L	Y	NO	H	LH
2	M	P	Y	NO	H	LH
3	F	L	Y	NO	H	LH
4	M	L	Y	YES	UH	LH
5	F	P	W	NO	H	LH
6	F	P	Y	YES	H	LU
7	F	L	Y	NO	H	LH
8	M	L	W	YES	H	LH
9	F	P	Y	NO	UH	LH
10	M	L	Y	YES	H	LH
11	M	P	Y	YES	UH	LU
12	M	P	Y	NO	H	LH
13	M	P	Y	NO	H	LH
14	F	L	Y	YES	UH	LH
15	M	L	Y	YES	H	LU
16	M	P	Y	YES	H	LU
17	F	P	Y	NO	H	LH
18	F	L	W	YES	H	LH
19	M	L	Y	NO	H	LH
20	F	L	Y	YES	H	LH
21	M	P	Y	YES	UH	LU
22	M	L	Y	YES	H	LU
23	F	P	Y	NO	H	LH
24	F	L	Y	YES	H	LH
25	M	P	Y	NO	H	LH
26	F	P	Y	YES	H	LH
27	M	P	Y	YES	UH	LU
28	M	L	Y	NO	H	LH
29	F	L	Y	YES	H	LH
30	F	P	Y	NO	H	LH
31	M	P	W	NO	H	LH
32	F	P	Y	NO	H	LH
33	M	L	Y	YES	H	LH
34	F	P	Y	YES	UH	LU

Table 2: Correlation between immediate improvement and gender.

	Immediate improvement		Total
Gender	Happy	Unhappy	
F	13	3	16
	81.3%	18.8%	100.0%
M	14	4	18
	77.8%	22.2%	100.0%
Total	27	7	34
	79.4%	20.6%	100.0%

Chi-square value = 0.062, p-value = 0.803
Chi-square test
[#] Non-significant difference

The comparison of immediate improvement was done between males and females using the Chi-square test. There was no significant difference in immediate improvement between males and females.

Table 3: Correlation between long term improvement and gender.

	6 Months Improvement		Total
Gender	Long Term Happy	Long Term Unhappy	
Female	14	2	16
	87.5%	12.5%	100.0%
Male	12	6	18
	77.8%	22.2%	100.0%
Total	26	8	34
	76.5%	23.5%	100.0%

Chi-square value = 1.043, p-value = 0.143
Chi-square test
[#] Non-significant difference

The comparison of 6 months improvement was done between males and females using the Chi-square test. There was no significant difference in 6 months improvement between males and females.

Table 4: Correlation between immediate improvement and pattern of enamel defect.

	Immediate Improvement		Total
Pattern	Happy	Unhappy	
L	14	2	16
	87.5%	12.5%	100.0%
P	13	5	18
	72.2%	27.8%	100.0%
Total	27	7	34
	79.4%	20.6%	100.0%

Chi-square value = 2.209, p-value = 0.047*
Chi-square test
*** Significant difference**

The comparison of immediate improvement was done between L and P pattern using the Chi-square test. There was a significant difference in immediate improvement between Pattern L and P. Happy score was significantly more among L pattern in comparison to P pattern.

Table 5: Correlation between long term improvement and pattern of enamel defect.

	6 Months Improvement		Total
Pattern	Long Term Happy	Long term unhappy	
L	14	2	16
	87.5%	12.5%	100.0%
P	12	6	18
	66.7%	33.3%	100.0%
Total	26	8	34
	76.5%	23.5%	100.0%

Chi-square value = 2.043, p-value = 0.043*
Chi-square test
*** Significant difference**

The comparison of 6 months improvement was done between L and P pattern using the Chi-square test. There was a significant difference in Immediate improvement between Pattern L and P. Long term Happy score was significantly more among L pattern in comparison to P pattern.

Table 6: Correlation between immediate improvement and colour of the tooth.

	Immediate Improvement		Total
Colour	Happy	Unhappy	
W	4	0	4
	100.0%	0.0%	100.0%
Y	23	7	30
	76.7%	23.3%	100.0%
Total	27	7	34
	79.4%	20.6%	100.0%

Chi-square value = 2.175, p-value = 0.048*
Chi-square test
*** Significant difference**

The comparison of immediate improvement was done between Color W and Y using the Chi-square test. There was a significant difference in immediate improvement between Color W and Y. Happy score was significantly more among Color W in comparison to Color Y.

The comparison of 6 months improvement was done between Color W and Y using the Chi-square test. There was a significant difference in 6 months improvement between Color W and Y. Long term Happy score was significantly more among Color W in comparison to Color Y.

Table 7: Correlation between long term improvement and colour of tooth.

	6 Months Improvement		Total
Colour	Long Term Happy	Long Term Unhappy	
W	4	0	4
	100.0%	0.0%	100.0%
Y	22	8	30
	73.33%	26.67%	100.0%
Total	26	8	34
	76.5%	23.5%	100.0%

Chi-square value = 2.395, p-value = 0.044*
Chi-square test
*** Significant difference**

Table 8: Correlation between immediate improvement and excess fluoride intake.

Excess Fluoride	Immediate Improvement		Total
	Happy	Unhappy	
NO	15	1	16
	93.8%	6.3%	100.0%
YES	12	6	18
	66.7%	33.3%	100.0%
Total	27	7	34
	79.4%	20.6%	100.0%

Chi-square value = 3.800, p-value = 0.041*
Chi-square test
*** Significant difference**

The comparison of Immediate improvement was done between without and with excess fluoride using the Chi-square test. There was a significant difference in Immediate improvement between without and with excess fluoride. Happy score was significantly more among those without excess fluoride in comparison to with excess fluoride.

Table 9: Correlation between long term improvement and excess fluoride intake.

Excess Fluoride	6 Months Improvement		Total
	Long term happy	Long term unhappy	
NO	16	0	16
	100.0%	0.0%	100.0%
YES	10	8	18
	55.6%	44.4%	100.0%
Total	26	8	34
	76.5%	23.5%	100.0%

Chi-square value = 9.299, p-value = 0.002*
Chi-square test
*** Significant difference**

The comparison of 6 months improvement was done between without and with excess fluoride using the Chi-square test. There was a significant difference in 6 months improvement between without and with excess fluoride. Happy score was significantly more among those without excess fluoride in comparison to with excess fluoride.

Table 10: Correlation between immediate improvement and long term improvement.

6 Months Improvement	Immediate Improvement		Total
	Happy	Unhappy	
Long Term Happy	23	3	26
	85.2%	42.9%	76.5%
Long term Unhappy	4	4	8
	14.8%	57.1%	23.5%
Total	27	7	34
	100.0%	100.0%	100.0%
Chi-square value = 5.535, p-value = 0.019* **Chi-square test** *** Significant difference**			

The comparison of immediate improvement was done with 6 months improvement using the Chi-square test. There was a significant association of immediate improvement with 6 months improvement. Majority of Happy were long term happy whereas 42.9% unhappy became long term happy.

DISCUSSION

Microabrasion removes the discolored portion of the teeth leading to improvement in colouration and formation of a densely compacted mineralized structure over the surface which is highly polished in nature[2].This technique uses the mixture of abrasive powder with hydrochloric acid or phosphoric acid for the removal of enamel surface layer.

The primary motive of this technique is to create immediate aesthetic appearance with minimal loss of tissue and no requirement of cavity preparation and its restoration[3].

The severity, location and intensity of the enamel stain together with the thickness of the enamel will determine its aesthetic outcome after undergoing the procedure of microabrasion[4]. The teeth which are supposed to improve in aesthetics with minimal removal of the hard tissue can safely undergo enamel microabrasion due to the non invasive nature of this technique in removal of intrinsic superficial defects[5].

The hypomineralized areas trapped within the mineralized outer surface corresponds to the opaque white enamel spots. This portion of enamel appears white due to high porosity which leads to reduction in translucency by the spreading of the light falling on this region. The abrasion or the remineralization of the enamel outermost layer over the period of time leads to the reduction in the intensity of these opaque white regions.[6]

The removal of the intrinsic stain in enamel with any colour or etiology and any type of surface irregularity can be done with microabrasion technique excellently. The exact depth of the instinsic stain or a surface irregularity is very difficult to determine so the technique of microabrasion should always be considered as a primary option before going for invasive procedures.[7]

This technique is a “controlled and non-invasive method” which causes very less wear of the enamel without any requirement of other relatively invasive procedures. Though veneers are considered good options for creation of the satisfactory esthetic appearance but when tooth tissue loss is compared, the microabrasion technique gains weightage.[8]

The patient’s age, the surface area of the defects and their socio economic status are the very important factors to be considered before choosing a treatment plan, and microabrasion is the most favourable to be considered as it’s a simpler technique, causes less tooth tissue loss and is very cost effective.[8-10]

The formation of the dense prismless layer over enamel gives the tooth a glass like appearance[11]. The reflection of the light over this layer and refraction through it takes place very differently when compared to the untreated surface that its optical properties masks the remaining subsurface stains, this special effect is called as the “abrasion effect” or “enamel glaze”[12].

On the other hand, the loss of the dental enamel can cause yellowness of the teeth due to the hue of the dentinal tissue revealed with the lost enamel but this yellowness can be corrected by the use of the bleaching agents based on carbamide peroxide or hydrogen peroxide. The application of bleaching gel is indicated on the healthy tooth tissue without any dentinal exposure, hence it should be performed under professional supervision. [13,14]

The combination technique of the enamel microabrasion and carbamide peroxide based bleaching is considered safe, conservative and very effective with a satisfactory esthetic outcome.[13] In this present study this combination technique was followed to gain the benefits of both these techniques.

The outcome and the concept of satisfactory esthetics after the treatment, are entirely different for the dental clinician and the patient, so in this study none of the indices were used. Instead, the happiness of the patients with the improvement in appearance after the treatment was recorded.

The line defects are usually the result of the disruption of the ameloblasts at the same functional age at almost the same time during the development of the enamel and the patched defects encroaches the larger surface area and may be considered as the coalescence of the line defects.[15]

The disturbance to the ameloblast was for the prolonged time period in the patched type pattern when compared to that in the line patterns[16], this pattern is of particular nature which extends under the surface towards the cervical region, and with the microabrasion the surface layer upto 100 -200

µm gets removed leading to exposed healthy normal enamel, and the outcome and stability of this treatment is long lasting [17,18].

The colour difference of the enamel may only depict the post eruptive take up of the stains through porous enamel and does not provide any additional information. If the opacities are too deep or the teeth are hypoplastic, microabrasion would not be the treatment of choice to improve the appearance.[15]That is why the results showed significant improvement in the patient with white colored enamel.

The esthetic management of the discolored and rough surface of the teeth involves the smoothening of the rough surface initially which is done by microabrasion and removal of discoloration later by the non invasive technique of bleaching.[19]

The combined result of the microabrasion and bleaching causes minorly altered demineralized surface over enamel which gets corrected by the precipitated minerals from the saliva and is of less clinical significance.[20]

CONCLUSION

The microabrasion procedure followed by bleaching may be considered interesting alternative to more invasive restorative techniques to correct enamel discolourations and defects.

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