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Case Report

Microabrasion Combined with Resin Infiltration to Treat a white Spot Lesion: A Clinical Case

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2. Key words

Noncavitated lesion; Minimal invasive dentistry; Resin infiltration; White spot; Enamel

1. Abstract

1.1. Objective: Describe, with a case report, the treatment of a vestibular white spot lesion due to traumatic hypomineralization in a maxillary incisor, through the combined use of microabrasion and resin infiltration.

1.2. Data: For this paper, the research were based on the scientific data bases PubMed. Sources: No one's involvement.

1.3. Study selection: The selection criteria used for the clinical case were patients that presented white spot lesions on the anterior teeth.

1.4. Conclusion: Findings of this case suggest that significant improvement in esthetics may be achieved by using these two combined clinical strategies to effectively mask deep white lesions resulting from development defects on enamel.

1.5. Clinical Significance: This approach provides a minimally invasive treatment which leads to a significative esthetic improvement. The final result represents a clinically and esthetically satisfactory outcome.

3. Introduction

White spot lesions in anterior teeth are often the cause of discomfort for patients and reason for treatment. Since esthetic goals have become highly relevant in recent years, patients' demands for a natural look through minimal invasive applications have increased [1].

In white spot lesions, the hypomineralization, confined to enamel, occurs due change in the chemical composition as a result of mineral loss and its substitution by organic fluids. As a consequence, the optical characteristics of the affected enamel are altered [2].

The whitish appearance stems from a high difference in Refractive Indexes (IR) between the enamel crystals and the medium inside the porosities, resulting from the modification of the spaces between crystals filled with either air (IR 1.00) or watery medium (IR 1.33). The difference of refractive indexes inside the porosities causes light scattering, showing the typical white and opaque appearance [3] (Table 1).

An infiltration resin showing good penetration characteristics was recently developed at Charitè University Hospital in Berlin and made available on the market under the brand name Icon® (DMG, Hamburg, Germany) [4].

Table 1: Materials

	1. OPALDAM®	2. OPALUSTRE®	3. ICON®
OBJECT	Gingival Resin Barrier	Microabrasion	Resin infiltration
COMPONENT	1) Syringe:	1) Syringe:	1) Icon-dry: 99% ethanol
	Cetyl Alcohol	a) 6,6% hydrochloric acid	
	a) Diurethane Dimethacrylate	b) 20-160µm silicon carbide microparticles	
	2) Micro 20g tips	2) OpalCups bristle	2) Icon-etch:
			a) Hydrochloric acid
			b) Pyrogenic silicic acid
			c) Surface-active substance
			3) Icon-Infiltrant:
			a) Methacrylate based resin matrix
			b) Initiator
LOTE		BDW3B	800057
EXPIRATION DATE		5/31/2019	2020-12
MANUFACTER	Ultradent, St. Louis, MO, USA Ultradent, St. Louis, MO, USA DMG, Hamburg, Germany		

Aiming to fill the intercrystalline spaces, this resin infiltration system is based on the hydrochloric acid erosion of the mineralized lesion surface, followed by the infiltration of a low-viscosity resin [5, 6].

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Designed to bridge the gap between prevention and restoration with a minimally invasive technique, Icon® can produce a positive esthetic effect by filling the pore system induced by hypomineralization, thus mimicking the existing healthy enamel by means of a lightcurable resin with a refractive index (IR 1.52) that is roughly similar to hydroxyapatite (IR 1.62) [4, 7].

The use of this technique sometimes leads to an inconsistent result due to the topographical characteristics of the lesions. Treatment should be carried out with due caution, analyzing the type of injury and looking for protocol modifications to improve efficacy. In cases where lesions, despite the superficial origin, develop in depth, the potential of infiltration is rapidly reached and only a small part of the lesion is infiltrated, with the consequence of an insufficient disguise of the lesion [2, 8].

The primary aims of the present study is to demonstrate the esthetic result in a deep white lesion treated firstly with a more invasive preliminary preparation of the enamel surface, such as microabrasion to ensure that infiltration can indeed reach the entire lesion, and then with resin infiltration technique.

4. Case Report

A 24 years old male requested a treatment to correct the appearance of a white spot on the maxillary left central incisor and blend it in with the surrounding enamel (Figure 1). Anamnesis and clinical assessment were performed to determine the etiology of discoloration. This case was classified as hypomineralized spot resulting from injury to the permanent incisor as a consequence of trauma to the primary tooth. After visual examination, thickness and depth were evaluated also using a curing light source positioned on the palatal surface of the tooth (Figure 2). Taking into consideration the type of lesion, the treatment decision was based on minimal intervention dentistry, combining the resin infiltration with Icon® (DMG, Hamburg, Germany) and microabrasion technique with Opalustre® (Ultradent, St. Louis, MO, USA). Patient signed an informed consent authorizing the treatment and use of images. Small composite-buttons were applied on the incisal third of the contralateral tooth (without bonding agent) and light cured. In this way the enamel shade closest to the one of the natural tooth could be determined (Figure 3).

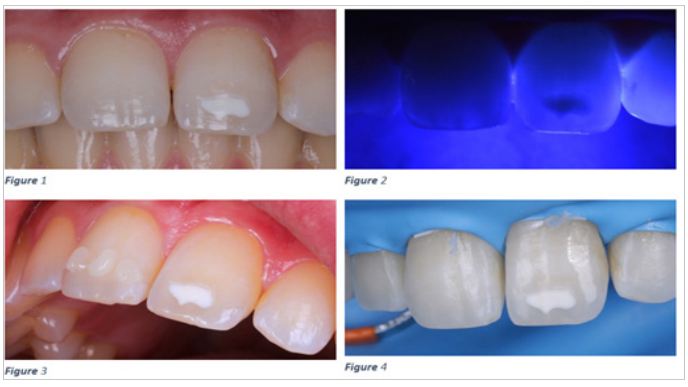
Figure 1

Figure 2

Figure 3

Figure 4

A rubber dam with ligatures was used in order to protect the oral soft tissues and provide a clean and dry working field. Thereafter the lesion was circumscribed with a resinous gingival barrier, the liquid rubber dam OpalDam® (Ultradent Product, Inc.) (Table 1) in order to protect the surrounding enamel during the procedure of microabrasion (Figure 5).

Enamel microabrasion involves the use of acidic and abrasive agents, such as 6.6% hydrochloric acid and silicon carbide micro particles in a watersoluble paste, applied to the enamel surface with mechanical pressure of a low-rotation micromotor [9].

The spot was therefore treated with two applications of Opalustre®, using the rubber cup at a slow RPM with medium pressure (Table 1). Each cycle was interspersed with Icon-Dry® for a visual check.

Once the microabrasion was complete, it was time to switch to the Icon® procedures (Table 1). The technique requires pre-conditioning of surface with 15% hydrochloric acid, which removes approximately 40 μm of enamel surface7,10.

The Iconetch® was used for 3 cycles, each one evaluated with Icon-Dry®, stirred with a micro-brush for 2 minutes and then rinsed with water.

The next step required a dry environment, so Icon-Dry® was now applied and left to sit for 30 seconds, followed by air drying, which increases the white appearance.

Then the IconInfiltrant® resin was applied (Figure 6), rubbed with a microbrush for 3 minutes in active movement, making sure that it penetrated deeply into the enamel by capillary action, filling the lesion. Care was taken to filter the surrounding light during the procedure. At the end, the resin was lightcured for 40 seconds. An immediate improvement in the esthetics was observed and a second layer of Iconinfiltrant® was applied and light cured again for 40 seconds (Figure 7).

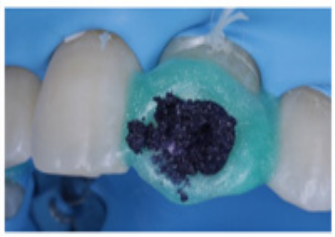
Figure 5


Figure 6

Under rubber dam isolation, the thickness lost during the process was recreated with the application of composite resin (Skin Ivory Inspiro, Edelweiss DR), preceded by etching the spot's edges with 35% phosphoric acid for 30 seconds (Figure 8) and the use of an adhesive bonding agent (Adhese Universal Ivoclar Vivadent). After the application of glycerin (Liquid Strip, Ivoclar Vivadent), to prevent the oxygen-inhibited layer of composite [11] on the surface area (Figure 9), the final curing process was accomplished. Post treatment photographs were taken, showing improved appearance

similar to the sound enamel surrounding the site (Figure 10).

Finishing and polishing were performed in a second appointment (Figure 11, Figure 12) with silicone polishers for composite restorations, polishing paste and felt coated discs (Figure 13, Figure 14).

5. Discussion

Unlike the systemic factors, reflected on all developing teeth, local factors such as a traumatic injury involve only teeth around the area of damage. A root of the primary tooth exerting force on the bud of the permanent tooth during morphogenesis can disturb the ameloblast layer. This type of trauma most frequently involves the incisors. However also an infection present on a deciduous tooth that propagates to the subsequent tooth during its morphogenesis can cause an abnormality in the latter [2].

The lesion appears as a white spot since the interprismatic spacing in a hypomineralized enamel scatters more light than sound ename [13, 12].

This type of lesions can present a wide variety of clinical expressions differing in shape, outline, localization and even color. They are generally punctiform, located on the incisal third of tooth crowns, often limited to one tooth and asymmetrical with respect to the corresponding contralateral tooth. The diagnosis of traumatic hypomineralization is essentially by exclusion [2].

There is a range of treatment options to improve the appearance of these white spot lesions. Infiltration technique is a recent concept that allows esthetic and functional properties improvement by sealing the microporosities through a lightcuring resin with low viscosity [4].

A fundamental aspect is to choose the most appropriate treatment starting from a correct diagnosis and a clinical evaluation of the depth of the lesion [2, 13, 14].

In cases where the defect develops in depth, just a small part is infiltrated, with the consequence of insufficient masking. For this reason Attal et al. introduced the concept of deep infiltration, that involves paying a price in the form of mild mutilation of the enamel to ensure that the infiltration can indeed reach the "ceiling" of the lesion [13]. Enamel microabrasion, where both chemical and mechanical abrasion simultaneously take place, can be a choice to remove that superficial layer of hypermineralized enamel.

Dental treatment has changed dramatically in recent years, providing alternatives to the more invasive restorations. A more conservative approach with the concept of minimal intervention is gaining popularity in modern dentistry [15].

Resin infiltration, proposed in the context of camouflage, represents an intermediary treatment even in cases where white spots spread deeply in the enamel. Through this technique the infiltrated lesion gains new mechanical and esthetic characteristics that are similar to healthy ename [12, 13, 16, 17].

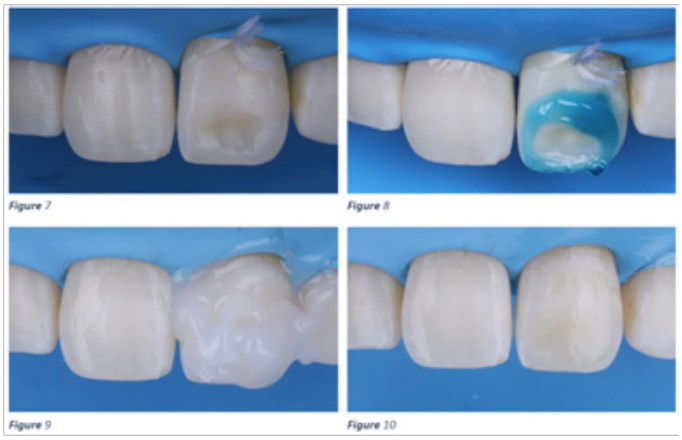
Figure 7 Figure 8 Figure 9 Figure 10

6. Conclusion

Microabrasion and infiltration technique showed to be two complementary techniques. Their application must always be assessed on the basis of diagnosis and topographical position of the enamel defect.


Figure 11 Figure 12 Figure 13 Figure 14

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