

Case Report

Esthetic Management of White Spot Lesions - A Minimally Invasive Approach

Renita Soares, Ida de Noronha de Ataíde, Marina Fernandes, Rajan Lambor

Department of Conservative Dentistry and Endodontics, Goa Dental College and Hospital, Bambolim

Abstract:

The teeth are an integral part of facial aesthetics. White spots on the facial surfaces of anterior teeth can present an unsightly appearance. Esthetic and conservative management of such lesions can be clinically challenging. Since minimally invasive dentistry is the need of the hour, the less invasive forms of operative intervention are being recommended. These case reports describe a minimally invasive technique to treat hypomineralised white spot lesions. The first case involves a combined approach of air microabrasion followed by resin infiltration with low viscosity light-curing monomers. While the second case highlights a combined technique of macroabrasion and composite resin restoration carried out to treat the extensive nature of the white spot. The proposed techniques might serve as an alternative to chemical microabrasion which is inefficient in eliminating white spots completely.

Key words: hypomineralization, microabrasion, resin infiltration, white spot lesions

Corresponding author: Dr. Renita Soares, Soares Mansion, H. No 202, Telaulim, Navelim, Salcete, Goa-403707, Email id: renita.soares2289@gmail.com

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Introduction:

In an era where the emphasis on beauty and esthetics is growing rather than diminishing, patients of all ages, races and genders are likely to ask the dental professional, how they can improve the appearance of their smile.¹ An unesthetic smile can have a great impact on a person's self-esteem and confidence.

Opaque white spots on the facial surfaces of the teeth can be an unsightly appearance. The whitish appearance is due to the presence of internal porosities beneath an apparently intact surface layer that alters the refractive index of usually translucent enamel.²

Esthetically displeasing discolorations of permanent incisors have multiple etiologies that include both genetic and environmental factors. Hypomineralization of the enamel is frequently associated with appearances ranging from white or opaque mottling, to discrete or generalized yellow-brown

discolorations. Unfortunately, involvement of the facial surface of the maxillary permanent incisors is not uncommon and can be of tremendous esthetic concern for young patients.³

Keeping in tune with the "conserve to preserve" motto, as dentists we are often faced with the dilemma of treating such cases in a minimally invasive manner. With increased dental awareness, the patient visiting the dentist is also conscious about obtaining esthetic results in as conservative a manner as possible. Therefore it is of utmost importance that the patient's opinion and expectations must be taken into consideration in the treatment decision making process. In order to arrive at a correct diagnosis and formulate a treatment plan, it is important to have a thorough understanding of the etiology underlying tooth discolorations.

The etiology of enamel hypomineralisation is varied. The most common causes include

perinatal problems, low birth weight, chronic infections, febrile episodes in infancy and traumatic dental injuries to primary teeth that may compromise both the deciduous teeth and their permanent successors.⁴⁻⁶ Enamel hypomineralisation is linked to faulty mineralization during enamel formation.⁷

Ameloblasts are highly sensitive to temperature changes thereby affecting their functioning. These changes result in altered deposition of enamel matrix, or more commonly, the mineralization of the matrix- thus both hypoplasia and hypomineralization can be a clinical sequel of febrile illnesses of infancy.⁵

Several techniques have been proposed to address the esthetic concerns of discoloured teeth. Management of teeth discolored due to fluorosis or hypoplasia can range from the less invasive procedures like enamel bleaching, microabrasion to the more invasive procedures such as composite resin restorations, veneers or artificial crowns. The choice depends on the severity of the condition.⁴ As rightly stated by Quist, restorative therapy requires substantial amounts of sound tissue to be sacrificed, and the first invasive intervention often brings the tooth into a circle of treatment and re-treatment, known as the 'death spiral of restorations'.⁸ Microabrasion has been advocated as a conservative treatment approach to manage discolorations when the lesion is confined to the outermost layers of enamel. This technique can be successful for lesions that are mild and relatively superficial and do not extend to deeper enamel layers. Although it does require removal of minimal tooth structure, this approach is more conservative than reducing the enamel surface for the placement of veneers.^{3,9,10,11} Air microabrasion is a minimally invasive procedure involving the use of a special handpiece that creates a beam of microscopic abrasive particles, propelled by a stream of compressed air. This technique has evolved over a period of time from its initial application as an

alternative for cavity preparation to gaining foothold as an essential means of providing conservative tooth preparation for preservation of maximal sound tooth structure.¹² Resin infiltration is a novel microinvasive treatment option for white spot lesions bridging the gap between prevention and restoration. The goal of this treatment approach is to occlude the microporosities within the lesion body by infiltration with low-viscosity light-curing resins that have been optimized for rapid penetration into the porous enamel. The resin penetrates into the lesion body driven by capillary forces.^{4,13} With the aim of improving the esthetic appearance of two patients, these clinical case reports describe a combined treatment protocol of microabrasion with resin infiltration and macroabrasion with composite resin restoration for treating white spots.

Case Reports

Case 1

A 32-year old female patient reported to the Department of Conservative dentistry and Endodontics. The patient's medical and dental history was non-contributory. Intraoral examination revealed a white spot lesion on the incisal one third of the maxillary right lateral incisor (Figure 1.0). Concluding a thorough clinical and radiographic examination, the white spot was diagnosed as enamel hypoplasia. The treatment plan outlined was elimination of the white spot using air microabrasion to aid in minimal tooth preparation.

Rubber dam was applied to protect the soft tissues and obtain a clean and dry working environment (Figure 1.1). The tooth was then cleaned with a rubber cup and prophylactic paste and impression putty was used to further isolate only the white spot on the lateral incisor to ensure that the adjacent tooth structure was not affected. The tip of the air abrasion handpiece (Danville Materials) was directed towards the white spot and controlled removal of tooth structure using a stream of aluminium oxide particles (27µm) generated from

compressed air was carried out (Figure 1.2). At the completion of this step, it was elected to carry out resin infiltration to mask the lesion. Following manufacturer's instructions the surface layer was eroded by application of a 15% hydrochloric acid gel (Icon-etch, DMG) for 120 seconds (Figure 1.3). Subsequently, the etching gel was thoroughly washed away for 30 seconds using water spray. To remove the water retained within the microporosities of the lesion body, lesions were desiccated by application of ethanol for 30 seconds (Icon-

dry, DMG) and subsequent air-drying. A resin infiltrant (Icon-infiltrant DMG) was applied on the lesion surface using applicator tip and allowed to penetrate for 5 minutes, following which light polymerization was carried out for 40seconds (Figure 1.4). Finally, the roughened enamel surface was polished using disks and silicone polishers to avoid rediscoloration by food stains. A significant improvement in the esthetic appearance was achieved.



Figure 1.0: Preoperative photograph showing hypoplastic area on incisal edge of maxillary right lateral incisor



Figure 1.1: Rubber dam isolation and tooth preparation with air microabrasion



Figure 1.2: Application of Icon-Etch



Figure 1.3: Application of Icon-Infiltrant



Figure 1.4: Postoperative photograph

Case 2:

A 23 year old female patient reported to the Department of Conservative dentistry and Endodontics, with a chief complaint of an opaque white spot on the maxillary left central incisor. Patient gave a history of trauma during childhood and presence of the white spot on the central incisor since eruption. No other relevant medical/dental history was reported. Taking into account the patients history and clinical examination, the lesion was diagnosed as enamel hypomineralization. However, upon clinical inspection it was noted that the opacity was of a significant degree and hence a slightly more invasive approach would be required. The treatment plan formulated was macroabrasion followed by composite resin restoration. Oral prophylaxis and polishing was carried. Macroabrasion was done using a fine grit diamond finishing bur along with water spray. This enabled removal of the white spot, approximately upto 0.5mm. After isolating the operative field, the area which was to receive the restoration was etched with 37% phosphoric acid for 15 seconds. The etchant was rinsed off and the preparation was thoroughly dried and a dentin bonding adhesive was placed with a microapplicator, following which it was light cured for 20seconds. The appropriate composite resin shade was selected, placed over the preparation and contoured. The increment was light cured for 20 seconds. Finishing and polishing was done to smooth any discrepancies and achieve an esthetic restoration in harmony with the adjacent tooth structure.

Discussion

Restoring hypocalcified enamel defects in the esthetic zone can be clinically challenging. This problem is magnified when the defects are prominently displayed in the middle one-third of maxillary incisors. A key factor that aids in the treatment decision making process and success of the case is correct diagnosis.



Figure 2.0: Preoperative photograph showing opaque white area on facial surface of maxillary left central incisor



Figure 2.1: Postoperative photograph following macroabrasion and composite resin restoration

Proper diagnosis of a white spot lesion may be difficult, requiring a two-fold clinical-diagnostic approach since smooth surface white spot lesions will not show up with any current caries detection tools or diagnostic radiographs. Therefore the best way to analyze them is to dry the tooth surface and examine it closely with good illumination. Incipient caries are visible when the enamel is dry, but will virtually disappear when the enamel is wet. In contrast, hypocalcified spots remain visible whether wet or dry.⁷ This is attributed to the fact that desiccating the lesion heightens the difference in refractive index between sound enamel and adjacent abnormal enamel.⁵

A classic feature of enamel hypomineralization is that the defects are well demarcated, localised and affect few teeth, unlike those in fluorosis which tend to have diffuse boundaries and affect many teeth with the appearance being more generalised.⁵ Tactile analysis can also aid in the diagnosis. If the surface feels smooth and appears shiny, the lesion

is probably inactive. If it feels rough, appears to be spongy or chalky, and has a dull or matte surface, the lesion has a porous surface that may lead to caries with cavitation and/or dental hypersensitivity. These lesions also may discolor with time, turning a brownish tint.⁷

The goal of clinical management of tooth discoloration is to produce an acceptable cosmetic result as conservatively as possible.⁴ Thus procedures that aid in the removal of carious hard tissue, causing little or no damage to the adjacent sound tooth structures are fast being researched. Some of these defects can be treated with microabrasion if they are on the enamel surface only (eg: demineralization from orthodontic brackets). Air microabrasion can be best described as a pseudo-mechanical, non-rotary method of cutting and removing dental hard tissue. It removes tooth structure using a stream of aluminium oxide particles generated from compressed air. The abrasive particles strike the tooth with high velocity and remove small amounts of tooth structure. Efficiency of removal is relative to the hardness of the tissue removed and the operating parameters of the air abrasion device. It is useful for removal of superficial enamel defects resulting in more conservative preparations than the drill.^{12,14}

However, if the defect spans the thickness of the enamel to the dentino-enamel junction, microabrasion will be ineffective. The conservative treatment of choice for managing such unsightly defects involves mechanical tooth preparation and restoration with direct composite resin as carried out in case II.¹⁵ Resin infiltration is a major breakthrough in microinvasive technology that reinforces and helps stabilize demineralized enamel, without sacrificing healthy tooth structure.⁷ The principle of masking enamel lesions is based on changes in light scattering within the

lesions. Sound enamel has a refractive index (RI) of 1.62. The microporosities are filled either with a watery medium (RI 1.33) or air (RI 1.0). The difference in refractive indices between the enamel crystals and medium contained within the porosities causes light scattering that results in a whitish opaque appearance. Resin infiltration produces a camouflaging or “chameleon effect” with a RI of 1.46. Therefore the difference in refractive indices between the porosities and enamel is negligible and lesions appear similar to surrounding enamel.^{8,13} In the cases described above we attempted to produce esthetic results by sacrificing minimal amount of tooth structure and combining various treatment modalities.

Conclusion

It is important to understand and bear in mind that certain clinical situations might require an alteration of the conventional treatment protocol to best suit the needs of the patient and produce a favourable outcome. In some cases removal of sound tooth substance cannot be avoided to mask the discoloration. There are no set guidelines enlisted to guide the dental practitioner, as to when to carry out operative treatment or opt for a non invasive technique. Therefore, in patients presenting with esthetic problems, it is important to understand and incorporate wherever necessary the self-perceived opinion of the patient in treatment planning.

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