

White lesions and bleaching treatments

Linda Greenwall discusses the aetiology of white lesions and their aesthetic management

Introduction

Many patients have white markings on their teeth. For some this may be very slight while for others the white markings may be very large and this may cause the patient distress. It is the aim of this article to discuss the aetiology of white lesions and how they occur on teeth and the aesthetic management of these lesions and to discuss detailed treatment options.

Table 1

Type of white lesions:	Aetiology
1. Isolated single white spots with diameter less than 0.5 mm adult maxillary incisors	Natural occurrence
2. White speckled lesions: mottled enamel	Fever during development
3. Multiple lesions: brown and white discolourations:	Fluorosis
4. White line/ stripes:	More severe Developmental Disturbances along the enamel maturation layers
5. White patches:	Trauma to the primary dentition
6. White spots covered with yellow layer	Bleeding had occurred during the traumatic injury and seeped into areas of mineralisation
7. Faint white lesions, some black edges	demineralisation lesions after removal of orthodontic brackets
8. Enamel defects and white lesions in deciduous incisors and molars	coeliac disease
9. White spot or enamel hypoplasia	preterm birth (prevalence from 45% normal birth weight to 92% preterm babies Lai et al 1997)

Why do white areas occur on teeth?

Chemical disturbances in enamel maturation

Fluorosis: over exposure to fluoride

This is a developmental condition which can occur as a result of too much fluoride ingested. This can be due to ingestion of too much fluoride in the water or, much toothpaste or fluoride tablets. Dental fluorosis

Educational aims and objectives

-The aim is to introduce the reader to the aetiology of white lesions and their aesthetic management

- The reader will be told how they occur on teeth and the aesthetic management of these lesions and detailed treatment options.

Expected outcomes

-The reader will understand the clinical benefits of managing white lesions

-The reader will be apply to apply the necessary techniques

is a developmental disturbance of dental enamel, caused by successive exposures to high concentrations of fluoride during tooth development, leading to enamel with lower mineral content and increased porosity. The severity of dental fluorosis depends on the length and timing of the overexposure to fluoride. The risk period for aesthetic changes in permanent teeth is between 20 and 30 months of age (Alvarez et al 2009). The recommended level for daily fluoride intake is 0.05 - 0.07 mg F/Kg/day, which can prevent dental caries by remineralisation of lesions. A daily intake above this level leads to an increased risk of dental fluorosis. Currently recommended procedures for diagnosis of fluorosis should discriminate between symmetrical and asymmetrical and/or discrete patterns of opaque defects.

The effects of fluoride on enamel formation causing dental fluorosis are cumulative, rather than requiring a specific threshold dose (Aoba et al 2002), depending on the total fluoride intake from all sources and the duration of fluoride exposure. Enamel mineralisation is highly sensitive to free fluoride ions, which uniquely promote the hydrolysis of acidic precursors such as octacalcium phosphate and precipitation of fluoridated apatite crystals (Aoba et al 2002). Once fluoride is incorporated into enamel crystals, the solubility of the mineral is reduced. This modulates the ionic composition in the fluid surrounding the mineral.

Trauma to the primary dentition:

The prevalence of this type of injury can vary from 12-69% according to Danish Studies (Andreassen et al 1973). It was estimated that enamel hypoplasia of traumatic origin is common. In a clinical study it was estimated that 10% of all enamel hypoplasias affecting anterior teeth in school children in Copenhagen were related to trauma in the primary dentition. The type of dental trauma sustained will determine the type of developmental disturbance.

The trauma interferes with enamel mineralisation. These enamel changed are confined to the site of coronal mineralisation at the time of injury (Andreassen et al 2007). It is assumed that the displacement trauma to the primary dentition causes damage to the adjacent tooth germ and possibly the odontogenic epithelium there by interfering with final mineralisation of enamel. The lesions are normally white. However, the bleeding that can occur causes the blood breakdown products to



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seep into the layers of mineralisation during the enamel formation. This could explain why yellow brown areas are located exclusively apical to the white lesions. Surface defects in the enamel are most probably reflecting direct injury to the enamel matrix before mineralisation has been completed.

Other causes

1. Process of enamel maturation. There is a disturbance in the formation of the enamel due to an illness of a high fever.
2. Demineralisation areas following orthodontic treatment. These white lesions become visible after the removal of the orthodontic brackets. Some have black edges around them. This is due to poor oral hygiene around the brackets as well as the consumption of a high cariogenic diet. These lesions are amenable to bleaching and microabrasion treatments.
3. Preterm birth

Rare diseases that may cause white lesions and enamel hypoplasia

1. Hypoparathyroidism
2. Exanthemous fevers
3. Coeliac disease
4. Acidosis

The prevalence of enamel defects in coeliac disease can be high. A recent study of 30 children with coeliac disease, mean age three, six years (Paez et al 2008) detected that 83.3% of patients with coeliac disease had enamel defects compared to the control of 53.3%. Symmetric defects were noted in 73.3%. Dental enamel defects were detected in deciduous molars (45.1%) followed by deciduous incisors.

Aesthetic management of these white lesions

Medical history

It is essential to try to obtain a detailed medical history from the parent if possible about the nature of any prolonged illness of the child. Questions such as multiple ear or chest infections at an early stage of the child's development that lead to prolonged use of antibiotics may give a clue to the aetiology of the occurrence of the white spots. The age at which the infection occurred is relevant as under two years of age there is an increasing chance of damage to the permanent dentition. Many of the lesions are chronological in that the incisal tip if it is affected would indicate that the fever of damage occurred very early in the child's life such as one to two years old.

The past administration of topical fluoride, tooth paste and indigestion location of where the patient grew up. This should give an indication of the likely chance of fluorosis being a cause of the discolouration. Under the age of six the swallowing reflex is not well developed and children can swallow between 25% and 33% of fluoridated toothpaste with each brushing (Dincer 2008).

Radiographs

Radiographs will not demonstrate the presence of these white lesions. Thus it is not necessary to irradiate a patient to gain much further information in a young adolescent. However teeth with other forms

Case 1:



Figures 1 and 2 (above): The appearance of fluorosis before whitening
Figures 3 and 4 (below): The appearance after prolonged whitening for 8-10 weeks to remove the yellow and brown discolouration. Home bleaching with 10% carbamide peroxide in bleaching trays was used. This was followed by two sessions of microabrasion treatment

of discolouration should have a periapical radiograph to examine the periapical status of the tooth.

Photographs and digital intraoral photography

It is more essential to take detailed photographs and in particular digital photography as this would give further information as to the nature and location of the white spots. Photographs of the labiolingual area are useful. Occasionally some of the white lesions are associated with hypoplastic enamel pits as well as defects and it is important to photograph these as there may be defective enamel present.

Treatment options for white lesions teeth with increasing intervention

1. Do nothing: if the patient or parent is unconcerned about the appearance of the teeth
2. Bleaching: usually home bleaching
3. Prolonged bleaching
4. Microabrasion
5. Megabrasion: Remove the white area with a handpiece prior to composite bonding
6. Composite bonding to mask the white spots
7. Porcelain veneers;
8. Crowns if the lesions are severe.

Bleaching treatments

There are several options that can be undertaken depending on the severity of the white spots that are present on the teeth and also the severity and

the multiple shades of discolouration, which is commonly seen in fluorosis. Bleaching is normally the first part of the treatment plan. The bleaching treatments will remove any orange brown or yellow lesions from the surface of the enamel particularly from the maxillary anterior teeth. Then the general background colour of the tooth is lightened so that the white lesions start to fade (see Figure 2).

Bleaching teeth that have inactive white spot lesions after fixed braces can be effectively undertaken. In a study of 10 patients (Knosel et al 2007) with inactive white spot lesions, bleaching treatments were effective in disguising the effect of the lesion and whitening the background colour of the tooth.

Why do the white spots get whiter during initial whitening treatment?

It is important to note that when bleaching treatments particularly home bleaching treatments are undertaken the white spots get whiter and brighter initially. It is essential to warning the patient of this phenomenon so that patients do not get alarmed when they see this occurrence. It is thought that the presence of oxygen inside the enamel during the initially bleaching stages is the cause of the bright appearance of the white spots. Another factor may be the partial dehydration of the tooth during the initial whitening treatment. The dehydration of the enamel is more rapidly and evident when the teeth are whitening using the power bleaching techniques. These techniques use higher concentrations of hydrogen peroxide often in combination with a light or heat at the chairside.

Some patients have panicked when they start to notice this occurrence as they thought that there was something wrong with the bleaching material that was causing damage to their enamel. Written documentation is important when discussing this information for patients prior to commencing treatments as patients would be fully aware of the risks and benefits of these treatments together with the expected side effects.

Prolonged bleaching treatments

Sometimes it may be essential to undertake home bleaching treatments using the bleaching trays for a prolonged period of time. The normal period for home whitening of upper and lower teeth is normally about two weeks for the upper teeth and three weeks for the lower teeth. These treatment times may vary depending on the degree of discolouration. Prolonged times for bleaching are undertaken to effectively remove the deep discolourations within the tooth. The first shade that will be removed is the brown discolouration. This is followed by the range and yellow shades. Then the underlying tooth will whiten and it is then the white spots that will remain. Further extended whitening will allow the white spots to fade into the white background of the tooth. Treatment is terminated once it becomes apparent that no further whitening is possible. Normally extended bleaching will allow the shade of the teeth to reach beyond the B1 Shade range. See Case 1.

Microabrasion

This is a technique that uses a chemical compound to simultaneously erode and abrade the enamel surface of a tooth to remove the brown and

Case 2:



Figures 5 and 6: The appearance of defective enamel which orange and brown and white lesions. Treatment involved home bleaching for seven weeks followed by microabrasion
Figures 7 and 8: The appearance after bleaching microabrasion and bonding

white spot enamel lesions on permanent teeth. Normally this is undertaken after a course of bleaching treatment. Microabrasion on its own is used for very young children with a single isolated lesion (at approximately eight years old) to microreduce the effect of the white patch. This would be followed later with full home bleaching when the child was about 12 years old.

A modification of this technique has been suggested by Ardu et al (2007) using a combination of the microabrasion paste which is hydrochloric acid followed by daily home application of casein phosphopeptide-amorphous calcium phosphate complexes (CCP-ACP). The proposed technique is based on reactivation of the enamel by elimination of its hypermineralised external layer through the microabrasion and the daily long-term home use of amorphous calcium phosphate.

Very deep extensive lesions can be treated by abrading the surface with a fast handpiece first by undertaking microreduction (Rosenthaler 1998 et al) of the enamel lesion. This is followed by chemical microabrasion using a 5% hydrochloric acid and pumice treatment (see Figure 4).

The materials used for the microabrasion technique use a compound of hydrochloric acid and flour of pumice (Greenwall 2001). A generic form consisting of 18% hydrochloric acid and pumice can be used onto the surfaces of the teeth. There are two specific proprietary products which are available. The first is a combination of 5% hydrochloric acid and silica to form a purple paste (Opalustre paste from Optident, Ilkley, West Yorkshire). Another product is 10% hydrochloric acid in combination with pumice and this is a green paste, Prema Paste (from Premier Dental Products bCo Norris Town Philadelphia, Myerson UK).

Application technique

The teeth need to be isolated with a rubber dam or a light cure dam. As this type of treatment is normally undertaken on a young patient, dehydration of the teeth can occur rapidly. The material is applied to the teeth using a special cup with hard bristles. The material is gently massaged

over the white lesion several times. Intermittent rinsing rehydration and observation are undertaken during this procedure. This is repeated several times. As the teeth dehydrate more of the white lesions may become visible (Kwon et al 2008) but it is only necessary to remove those lesions that are visible when the tooth is fully hydrated. The abrasion times are very quick. Only a few seconds of application time are utilised with the paste onto the teeth and then this is rinsed and reviewed. Fluoride, in the form of a gel is applied at the end of the treatment to restore the fluoride rich layer that was removed with the microabrasion. Only a few microns are removed and the procedure is undertaken in a gentle manner. The patient is warned that after the first treatment, the appearance of the teeth may look worse as the teeth are dehydrated after the appointment. The following day when the teeth are rehydrated the enamel will appear smooth and lustrous and will not pick up stains. It is essential to review the patient one-week after the initial treatment. **1**

independent seminars

Linda Greenwall is speaking at the World of whitening seminar and hands-on session on Friday 24-Saturday 25 April in London. She is also speaking at the World Aesthetic Congress 12-13 June. For further information and to book your places please call Independent Seminars 0800 371652 or visit www.independentseminars.com

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