

Enamel staining and hypoplasia due to multiple causes in a Nigerian adolescent: report of a case

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Summary

The aim of this report is to discuss the effects of childhood drug ingestion and metabolic disturbances of ill health in childhood on the coloration, structure and therefore the aesthetics of permanent dentition. To illustrate this, the report presents a case of a 15 year old Nigerian girl with combined tetracycline staining and chronological enamel hypoplastic defects on her teeth. The relationship between the clinical appearance of her teeth and her childhood medical and drug history are analysed. The various treatment modalities available for the management of the dental anomalies are discussed along with the rationale for the treatment given. Strategies for the prevention of these conditions are emphasised.

Keywords: tetracycline, childhood diseases, enamel hypoplastic defects, discoloured teeth, management, bleaching, veneers, crowns.

Résumé

Le but de ce rapport est de discuter les effets de l'ingestion des médicaments et les desordres métaboliques pendant les maladies de l'enfance sur la coloration, la structure et l'esthétique de la dentition permanente. Afin d'illustrer ceci, le rapport présente le cas d'une fille Nigérienne âgée de 15 ans avec une dentition colorée par la tetracycline et des déficiences de l'émail hypoplasique sur ses dents. La relation entre l'apparence clinique de ses dents et l'histoire médicale et des médicaments pendant l'enfance sont analysés. Les modalités variées des traitements d'anomalies dentaires disponibles sont discutées par rapport aux traitements administrés. Les stratégies pour la prévention de pareilles conditions sont mise en exécution.

Introduction

Developmental structural defects of enamel form a permanent record of any disturbance occurring during the tooth's formative period. Such defects include hypoplasia and hypocalcification. Enamel hypoplasia is quantitative defect in enamel structure produced by an interference or disturbance in amelogenesis. Clinically, it is seen as circumferential or bandlike irregularity and indentation on the enamel surface or it may occur as discrete pitting. The lesions acquire yellow or brown colouration from deposition of stains. Enamel hypoplasia, which affects several teeth in the mouth, may be due to hereditary or environmental factors. Hereditary factors often cause diffuse, sometimes vertical orientation of derangement in enamel form whereas environmental disturbances cause in general, horizontal defects [1]. Environmental factors include many conditions such as maternal infection, low birth weight and prematurity.

Nutritional deficiencies, haemolytic disease of the newborn, respiratory disease of the newborn, hypocalcaemia, neurological disease as well as prolonged infantile gastroenteritis have also been shown to be environmental factors in enamel hypoplasia. Other childhood fevers like measles [2] which cause general disturbances of nutrition and metabolism, are similarly included. These conditions which occur in utero, perinatally or during the first years of life, have been associated with enamel defects because it is during this period that many teeth are developing. The clinical significance of enamel hypoplasia is primarily that of aesthetics due to abnormal form and colour.

Tetracycline may also cause abnormal colouration of the teeth. Tetracycline have the capacity to chelate strongly with calcium and become incorporated into tissues that are undergoing calcification at the time of their administration. Because of the high concentration of calcium in teeth and bones, tetracycline deposits readily occur in them. On the teeth the deposits are permanent and tetracycline can produce discolouration of the dentition in a variety of shades of yellow, grey and brown. The first reference to teeth discolouration due to tetracycline appeared in 1956 from the work of Schwachman and Schuster [3] who were studying children on longterm antibiotics. However it was not until 1962 that this unfortunate side effect gained wider recognition. Wallman and Hilton examined tetracycline-stained teeth in children who were given this antibiotic at birth. They noticed a pattern of tooth involvement which depended to some extent on the gestational age of the child. They found that in most full-term babies, the pigmentation affected the gingival parts of the incisors and incisal parts of the canines and molars. In the more premature babies, the yellow colour involved more incisal portions and larger areas of the incisors. The severest tooth changes occurred in the highest total dose per kilogram birth weight.

Tetracycline-stained tooth tissues fluoresce bright yellow under ultraviolet light [2]. The colour of tetracycline stains varies according to the age of the child; thus a bright yellow pigmentation in a young child tends to get darker as the child grows older [2,4]. This is due to the exposure of the tetracycline to undergo photodegradation with darkening of the pigmentation [5] and gradual loss of fluorescent capacity. Different analogues of tetracycline cause varying severity of staining in teeth. As in hypoplasia, aesthetics is the main problem associated with tetracycline-stained teeth.

The report presents an unusual case of a patient with combined tetracycline stains and generalised enamel hypoplasia. The aim of the report is to discuss the effects on the permanent dentition of metabolic disturbances that may accompany ill health in childhood. It also considers the effects of tetracycline ingestion during teeth-forming years. It describes the various modalities of treatment available for managing this uncommon combination of

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dental anomalies. It also discusses the rationale for the treatment option considered for this patient.

Case report

A 15-year-old Yoruba (Nigerian) girl reported in the Dental Clinic of the University College Hospital (UCH), Ibadan requesting professional cleaning of her teeth to make them whiter. Her teeth had been discoloured for as long as she could remember. She and her mother felt the teeth seemed to be getting darker with time. The patient had tried to brush off the stains to no avail. She then sought treatment from the State Dental Clinic from where she was referred to UCH.

Examination revealed a healthy looking patient who responded intelligently to questions and showed no obvious neurological problems. Her medical history was not remarkable. She had an Angle's class 1 jaw relationship with no significant extra oral findings. Intra-orally, all her teeth were present except the third molars. She had occlusal dental caries on her mandibular right first molar as well as on both mandibular second molars. There was also some marginal gingival inflammation on the lingual aspect of her lower right premolars and first molar. Most of the teeth were grey throughout their length. Only the premolars and second molars were normal in colour (Fig. 1). In addition, the affected teeth all displayed brown horizontal bands of deficient enamel structure at varying levels on different teeth. These bands occurred at about:

- the incisal tip and middle portions of the upper and lower central incisors and first molars as well as on the lower lateral incisors.
- the area incisal to the middle of the upper lateral incisors
- the incisal third area of the canines

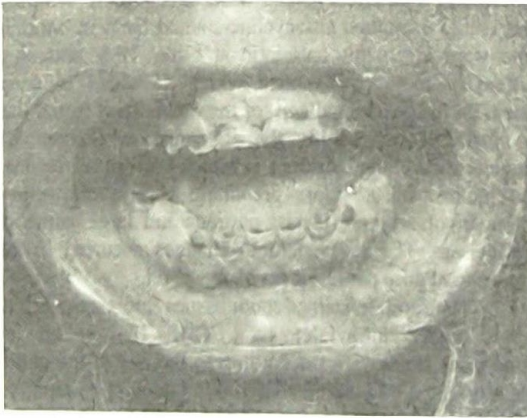


Fig 1: Only the premolars and second molars are unaffected by tetracycline staining and chronological enamel hypoplasia

Only the premolars and the second molars were devoid of these horizontal defects and discoloration. However some white and brown flecks were observed in

the incisal portions of the upper first premolars, but there was no associated deficiency in the structure of these teeth.

Although there are limitations to maternal recall, nevertheless, her mother was questioned about the patient's perinatal and childhood medical and drug history. The obstetric history was not remarkable and there was no history of maternal infection or drug ingestion during pregnancy. She however admitted she occasionally took local herbal concoction during pregnancy. Although the gestational period was 35 weeks, delivery was uneventful. However on the 10th day of life, the patient developed severe neonatal jaundice which the mother said did not clear up totally until the child was about 6 weeks old. Consequently the child was described as "floppy" until the first time she was seen in the Paediatric Unit of UCH at 5 months of age. Her case notes revealed she was brought in because of recurrent seizures. The records showed that she had had about 5 previous episodes of convulsions before she came to this hospital- the first occurring when she was 25 days old. The seizures were not associated with fever. Investigations were carried out, a diagnosis of bilirubin encephalopathy was made and treatment was instituted. The patient was subsequently attended to on outpatient basis for several episodes of upper respiratory tract infections and gastroenteritis. Her case notes also revealed that she had severe measles at the age of 18 months and was hospitalized.

The mother admitted that because the child was often ill as a baby, she gave her frequent unprescribed doses of tetracycline at the first sign of any illness and as prophylaxis to "keep infection away". She administered several teaspoons of the drug 3 to 5 times a day for periods ranging from 2 to 10 days. As the child grew older, the mother reported that the frequency of illness decreased and in the last 5 years, the child's health was comparable to that of "normal" siblings in the family.

A diagnosis of tetracycline-staining of enamel hypoplastic teeth was made. She also had marginal gingivitis on the lingual aspect of her mandibular right premolars and first molar.

In view of this patient's age and large pulps, vital bleaching was first attempted to improve the colour of the teeth. The results were not encouraging as the teeth were darkly stained. Polishing of all the stained teeth was found to be impractical because the discoloured hypoplastic areas were deep. Composite veneers over opaque coating were planned for the six anterior maxillary teeth to improve the patient's appearance. Although she had a wide smile that exposed the premolars, they were unaffected by the discoloration. Her mandibular anteriors could not be veneered as they were too thin labioincisally. Fortunately, they were covered by the lower lip when she talked or smiled so they did not need to be restored. The carious teeth were restored with amalgam fillings after scaling, polishing and oral hygiene procedures to restore gingival health.

Discussion

This case is unusual because both enamel hypoplasia and tetracycline discoloration were found in the teeth of this patient. The tetracycline staining was present on all the teeth that were undergoing calcification in the first 18 months of life. The premolars and second molars whose calcifications take place between 18 and 30 months were unaffected. Although it has been suggested that very heavy dosage of tetracycline may cause hypoplasia, the teeth are said to be usually of normal form [2]. Even though the

exact dosage of tetracycline ingested by this patient as a child is unknown, the frequency with which her mother gave her drug makes it a possible cause of the hypoplastic defect seem.

The several episodes of infections recorded in the notes as well as the neurological disease caused by bilirubin are also likely causes of hypoplastic lesions. These episodes of illness would have resulted in metabolic disturbances to which ameloblasts are very sensitive. This could result in disturbance of amelogenesis that manifests clinically as structural defects in the tooth. Moreover, the positions of the hypoplastic defects roughly coincide with the periods the patient had bilirubin encephalopathy and measles infection, which the mother described as very severe. It is however not possible to separate all the aetiological factors as several variables may occur together and may interact. The hypoplastic defect may be the result of the cumulative severity, duration and timing of these metabolic disturbances rather than of their specific nature [7].

The main clinical problem in this case is how best to improve the appearance of the teeth. Many discolourations can be corrected or greatly improved through conservative methods such as bleaching or veneering. Bleaching should first be considered. When the discolouration is mild and the pigmentation is limited to the outer surface of the enamel, bleaching is successful. However, when the staining is marked, techniques that do not include devitalisation of the teeth may not be successful. The prognosis of bleaching root-filled teeth is much better than for bleaching vital teeth because of better access to the stained areas in root filled teeth. Several methods using modern aesthetic restorative materials have been suggested for the restoration of hypoplastic and discoloured of teeth. The simplest technique involves polishing off the hypoplastic surface to remove extrinsic stains prior to acid etching and then application of composite resin to the enamel surface. The disadvantage of this technique is that the resulting restoration may not always be able to completely mask the underlying discoloured tooth structure. Removal of stained tooth tissue before application of composite resin may be done. However, removal of all the stained tissue is not always practical especially where the hypoplastic defects extend deeply. In such cases, an opaque coating can be applied to mask the staining [9]. Other methods suggested for treatment of tetracycline-stained teeth that may also be used for hypoplastic defects include bonding of composite, acrylic or porcelain veneers to acid etched labial surfaces of stained teeth using a resin composite [10].

An aesthetic veneer is a layer of tooth-coloured material that is used to cover an unsightly area of a tooth. It may be made to cover a portion of the labial surface or the entire facial surface. There is controversy regarding the extent of tooth preparation required. Some operators prefer to etch and apply the veneer over the facial surface without removing any enamel [12]. The advantage this has is that it makes the procedure reversible. However several problems exist with this method. The restoration is often overcontoured to produce an aesthetically acceptable appearance. This appears and feels bulky and unnatural. Gingival irritation frequently occurs around the overhanging margins. There is also a greater likelihood of the veneer dislodging when no tooth structure is removed

[13]. To enhance the success of veneers, removal of some enamel or at least a roughening of the surface should be done before placing a veneer. This will provide adequate space for the veneer material as well as opaque and tinting that may be required for maximal aesthetics. It avoids the need for overcontouring. This method will also remove the outer fluoride-rich, acid-resistant layer of enamel for better retention of the acid-etched surface as well as create a rough surface for improved bonding. In addition, it will help to establish a definite finish line that will provide better gingival health.

Full coverage restorations are normally a satisfactory treatment for hypoplastic as well as tetracycline-stained teeth. However, this often involves preparing otherwise sound teeth. Besides, where several teeth are involved, full coverage is a considerable undertaking. The procedures demand high levels of clinical and technical skills and are expensive. In addition, there is the possibility of pulpal damage in young teeth because of large pulps. Lifelong maintenance implications must also be fully understood by the patient.

The management of the tetracycline-stained hypoplastic teeth depends on the severity and depth of staining as well as on the depth and location of the hypoplastic defects. The age, gender and mental sensitivity of the patient to the appearance of the teeth must also be taken into consideration. Thus the reaction of the patient to their dentition could range from extreme despair of the beauty conscious teenage girl (as in this case) to the apparent apathy of an elderly man who is not bothered by the appearance of his teeth. This is particularly so as these teeth do not often pose any other problem apart from their poor appearance. Where treatment is indicated, the most conservative methods that will effect correction of the aesthetic problems should be employed.

Conclusion

Even though these anomalies are not always preventable, the tetracycline stains could have been prevented. This would have made the management of this case more conservative as partial veneers covering just the hypoplastic defects would have been sufficient to restore the aesthetics of the lateral incisors and canines. It cannot be overemphasized that tetracycline should not be administered to children below the age of 8 years if unsightly discolouration of their permanent anterior teeth is to be avoided [14]. Alternative antibiotics should be used in children during these tooth forming years. It is also necessary to educate mothers on the effects of indiscriminate use of antibiotics in places where these can be obtained without prescription.

Hypoplastic defects sometimes result from factors like nutritional deficiencies and some controllable infections [15]. The dentist should exert his or her influence to ensure that patients and their children adopt sound nutritional practices and receive recommended immunization procedures.

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