

Tetracycline-Induced Discoloration of Deciduous Teeth: Case Series

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Abstract:

Tetracycline was the choice of antibiotic in some of the life-threatening bacterial infections. Due to its adverse effects and ability to cross-placental barrier, its use is contraindicated in pregnancy and in children. This is a case series of four patients with tetracycline-induced discoloration in primary teeth.

Key Words: Primary teeth, stains, tetracycline

Introduction

Invention of antibiotics has revolutionized the battle against bacterial infections. Self-medication and inappropriate administration by a regional medical practitioner is widely practiced in many parts of India without the knowledge of its adverse effects, indications, and contraindications. This may be crucial in drugs crossing placental barrier and in initial stages of organogenesis. Tetracycline is one such group of antibiotics.

Tetracycline group of antibiotics were discovered in 1945 and administered in 1948.¹ Tetracycline is a broad-spectrum antibiotic that crosses placental barrier.² Tetracycline was the first line of therapy in treating infections caused by *Mycoplasma pneumoniae*, *chlamydiae*, *rickettsia*, and some *spirochaetes*.³ It has a wide range of adverse effects and is known for a unique property of being incorporated into skeletal and dental tissues at sites of active mineralization and staining of these tissues. Under ultraviolet irradiation, the tissues exhibit fluorescence, a characteristic feature of tetracycline molecule. Because of these adverse effects, its administration is contraindicated

during pregnancy.⁴ Various awareness programs were started to reduce the use of tetracycline, which resulted in decline in the occurrence of tetracycline stains. This is a unique case series of tetracycline staining in primary teeth.

Case Reports

Case 1

A 7-year-old female patient reported to Department of Pediatric Dentistry, with a complaint of discoloration of teeth since childhood. Mother presented history of usage of tetracycline (resteclin) drug during the 1st-3rd month of pregnancy, which was prescribed by a regional medical practitioner for fever (Figures 1-5).

On examination, there was a generalized grayish to yellow brown discoloration seen in the cervical middle and incisal regions of primary maxillary and mandibular teeth. All the teeth were stained except 51 and 61. Stains were not scrapable by dental explorer or a scaler. The stains fluoresced when observed under ultraviolet (UV) light. For further investigation 61 was extracted



Figure 1a: Clinical image of teeth with distinct grayish discoloration of primary anterior teeth.



Figure 1b: Orthopantomogram image of teeth with normal enamel, dentin and bony patterns.

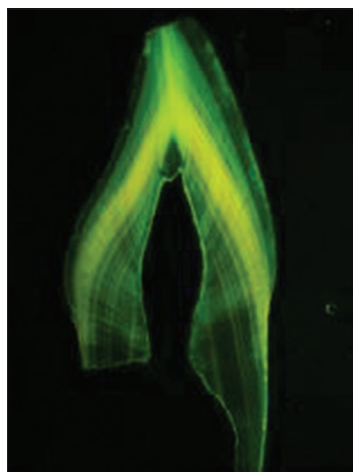


Figure 2: Ground section tooth under fluorescent microscopy ×2 magnification shows distinct continuous fluorescent bands.

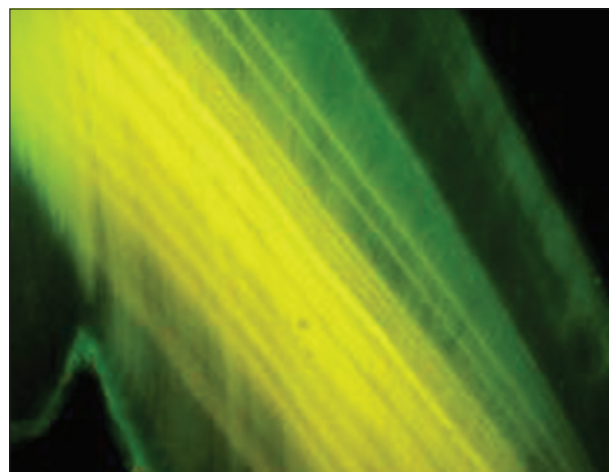


Figure 4b: Ground section tooth under fluorescent microscopy ×10 magnification shows alternative fluorescent bands following the contour of teeth.

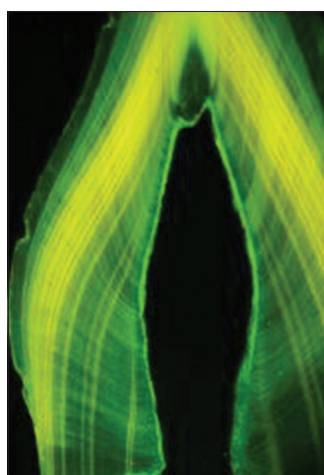


Figure 3: Ground section tooth under fluorescent microscopy ×4 magnification shows distinct continuous fluorescent bands.

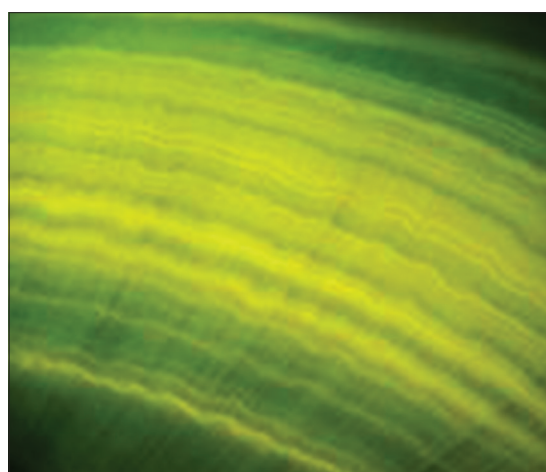


Figure 5a: Ground section tooth under fluorescent microscopy ×40 magnification shows alternative fluorescent wavy bands.

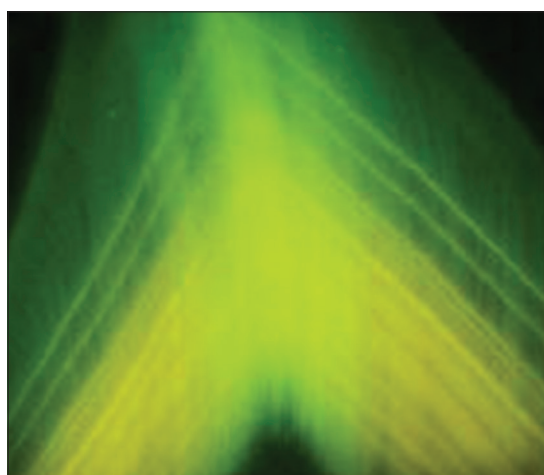


Figure 4a: Ground section tooth under fluorescent microscopy ×10 magnification shows alternative fluorescent bands at the incisal edge with haziness at the junction.

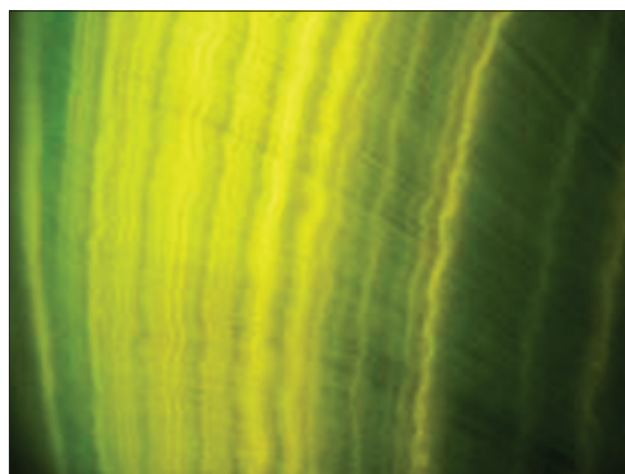


Figure 5b: Ground section tooth under fluorescent microscopy ×40 magnification shows alternative fluorescent wavy bands.

as the tooth was mobile and the tooth sections were sent for ground section examination under fluorescent microscopy.

Fluorescent microscopy images showed clear discrete fluorescent bands, which were restricted to the dentin alone

under low magnification. Under higher magnification, the bands were continuous, wavy with varying thickness. These bands represent the timing of administration of the drug. Since, it was continuous; we could conclude that the drug was administered continuously through the time of calcification of the dentin.

The history of extensive tetracycline therapy during her pregnancy, yellow to brownish discoloration, fluorescence, clinical examination, and other investigations suggest that the discoloration of teeth may be due to tetracycline.

Case 2

A 6-year-old male patient reported to Department of Pediatric Dentistry, with a complaint of pain in the left upper teeth. On examination, 61 was missing, and dental caries was noted in 55 and 65. There was a generalized grayish discoloration of anterior teeth and yellowish discoloration of posterior teeth, which could be graded as moderate tetracycline staining. Child presented with a history of trauma a year back wherein 51 was avulsed. Stains were not scrapable by dental explorer or a scaler. The stains observed under UV light revealed fluorescence. Child's mother didn't present proper history regarding the usage of medications during her pregnancy. Pulp therapy was done in relation to 55 and 65. No treatment was done to restore esthetics (Figure 6).

Case 3

An 8-year-old male patient reported to Department of Pediatric Dentistry for a dental checkup. The child was in mixed dentition stage with permanent maxillary incisors and first molar, mandibular incisors and first permanent molars erupted. All teeth were present, and 53 was carious. There was yellowish discoloration of primary posterior teeth, which could be graded as moderate tetracycline staining, and interestingly permanent first molars, which could be graded as mild degree. Stains were not scrapable by dental explorer or a scaler. The stains were observed under UV light, which revealed fluorescence. On questioning, child's parents gave a history of regular asthmatic attacks for which he has been using medication. However, parents didn't present proper history regarding the usage of medications during her pregnancy. No treatment was implicated except for restoring 53 with glass ionomer cement (Figure 7).

Case 4

A 7-year-old male patient reported to Department of Pediatric Dentistry for a dental checkup. The child had mixed dentition with permanent maxillary incisors and all first molars erupted. All teeth were present except for 52. There was a yellowish discoloration of primary posterior teeth, which could be graded as moderate tetracycline staining. Stains were not scrapable by dental explorer or a scaler. The stains were observed under UV light, which revealed fluorescence (Figure 8).

Differential diagnosis includes alkaptonuria, biliary atresia, congenital erythropoietic porphyria, congenital

hyperbilirubinemia, dentinogenesis imperfect, erythroblastis fetalis, enamel hypoplasia, fluorosis, and neonatal hepatitis.

Tetracycline stains are usually not associated with any hypoplastic defect. Treatment is aimed primarily on esthetics. Esthetic management was not done in the above cases as the teeth were near to exfoliation. Parental and child counseling was done.

Discussion

Discoloration of teeth was reported in children who were on long-term tetracycline therapy. The occurrence of tetracycline stains in primary teeth is not reported quite often. The last case report published was two decades ago. However, there are no



Figure 6a: Clinical image of teeth with distinct grayish discoloration of primary anterior and posterior teeth.



Figure 6b: Clinical image of teeth with distinct grayish discoloration of primary anterior and posterior teeth.

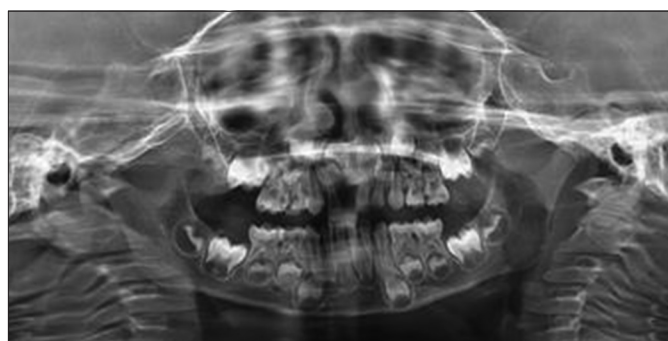


Figure 6c: Orthopantomogram image of teeth with normal enamel, dentin and bony patterns.



Figure 7a: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.



Figure 8a: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.



Figure 7b: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.



Figure 8b: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.



Figure 7c: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.



Figure 8c: Clinical image of teeth with distinct grayish discoloration of primary posterior teeth with normal permanent anterior teeth.

instances where fluorescent microscopy images are published. In the current article, we described the pattern of images.

Yellow-staining of bones and teeth caused by tetracycline has been shown to develop in animals. The prevalence of tetracycline induced staining is approximately 3-4%.⁵ The

discoloration is due to the formation of tetracycline-calcium orthophosphate complex.⁵⁻⁸ Tetracycline is incorporated into the tooth through the blood to the coronal portion of the pulp to the sub-odontoblastic area ending into pre-dentin. According to Cohlan, the hue of the discoloration is dependent on the type of tetracycline while their intensity depends on the dosage and duration of drug treatment.⁹

In 1970, American Academy of Pediatrics officially stated that preparations of the tetracycline family should not be administered to children <8 years of age because of their side-effects in developing hard tissues.¹⁰ Various theories have been proposed to explain this mechanism. According to Berger, tetracycline attaches to the glycoproteins in acquired pellicle.¹¹ Other hypothesis includes binding of tetracycline with plasma proteins and deposition in collagen-rich tissues, chelation of drug with iron to form an insoluble complex and deposited in dentin during secondary dentinogenesis, which is accelerated in bruxists.^{6,12}

Based on the extent and color of staining, it is classified into the first degree (Mild tetracycline staining) includes teeth with Yellow to grayish staining with no banding and is spread throughout the tooth uniformly. Second degree (Moderate tetracycline staining) teeth with Yellow brown to dark grayish staining, Third degree (severe tetracycline staining) teeth with blue gray or blackish staining associated with banding across the tooth and fourth degree includes intractable staining that is so severe that bleaching is ineffective.^{13,14}

According to Tredwin, Scully anterior primary teeth are susceptible to discoloration by systemic tetracycline from 4 months in-utero through 9 months post-partum and anterior permanent teeth are susceptible from 3 months post-partum to 8 years and in pregnancy in general.^{15,16}

In younger children, teeth are bright yellow, while in older children, they are brownish. Change in color is because of the oxidation process of the tetracycline compound in the teeth. These changes are the result of an oxidation product of tetracycline induced by exposure to light.

Prevention of staining of teeth can be done by reducing the dose of the drug, avoiding the drug in the critical period of mineralization of teeth. In an animal study done on rats co-administration of vitamin C with minocycline reduced the formation of the degraded product of the quinone ring structure thereby preventing the stains.¹⁷ Though there is no evidence of its teratogenic effects, malformation of chick embryos was seen in embryos which were administered with tetracycline.¹⁸

Conclusion

This is the first case series to be published on tetracycline in primary teeth after approximately a decade. The alarming part of this case series is that all the patients belong to the same

village. Hence, it is evident that use of tetracycline has not been completely avoided, but still prescribed because of lack of awareness among regional medical practitioners. Hence, the need for conduction of awareness programs in the rural region is emphasized.

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