

AESTHETIC SOLUTION TO FLUOROSIS IN A CHILD

SOLUÇÃO ESTÉTICA PARA A FLUOROSE EM CRIANÇA

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ABSTRACT

Dental fluorosis is a defect of enamel formation caused by chronic ingestion of fluoride from different sources during tooth development, which results in interference in proper mineralization. Clinically the tooth enamel may present as white striae along the lines of enamel, opaque white spot and in more severe cases as brown spots. Diagnosis is based on clinical characteristics associated with a history of exposure to fluoride. The aim of this report is to present a treatment in a child with severe aesthetic compromising in anterior maxillary permanent teeth caused by fluorosis. The treatment was based on a combination of three techniques in order to be minimally invasive, enhance aesthetics and preserving the dental structure.

Descriptors: Enamel, Fluorosis, Microabrasion, Vital bleaching, Composite resin, Child, Odontopediatrics.

RESUMO

Fluorose dental é um defeito na formação do esmalte causado pela ingestão crônica de flúor de diferentes origens durante o desenvolvimento dentário, o que resulta em uma interferência na mineralização adequada. Clinicamente, o esmalte dentário pode assumir uma tonalidade esbranquiçada ou exibir pequenas manchas ou linhas brancas e, nos casos mais severos, manchas amarronzadas. O diagnóstico é baseado em características clínicas associadas com a história de exposição ao flúor. O foco deste estudo é mostrar o tratamento em uma criança com grande comprometimento estético em dentes permanentes anteriores superiores acometidos por fluorose. O tratamento baseou-se numa combinação de três técnicas, a fim de ser minimamente invasiva, melhorar a estética e preservar a estrutura dentária.

Descritores: Esmalte, fluorose, microabrasão, clareamento vital, resina composta, criança, Odontopediatria.

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INTRODUCTION

Fluoride has been used worldwide to prevent dental caries, despite its link with dental fluorosis¹. The literature has revealed increasing prevalence of dental fluorosis, ranging between 7.7 and 80.9% in the areas with fluoridated water and between 2.9 and 42% in the areas without water fluoridation^{2,3}. Enamel fluorosis is a defect of enamel formation, in which fluoride ingestion during critical periods of mineralization results in interference in proper mineralization⁴. It is characterized by hypomineralization caused by the retention of amelogenin proteins by fluoride⁵ and it is believed to be caused by chronic ingestion of fluoride during tooth development¹.

Clinically the tooth enamel may present fluorosis as white striae along the lines of enamel perikymata, opaque white spots and in more severe cases it results in brown spots due to extrinsic pigmen-

tion^{6,7}. The severity depends on the concentration of fluoride exposure, the stage of ameloblastic activity, and individual variations in susceptibility^{8,9}. The diagnosis is confirmed on the basis of the clinical characteristics associated with the complete histories of exposure to fluoride¹⁰.

Since these defects in dental enamel may have significant aesthetic, functional¹¹ and psychological impact⁷, it is necessary for the dentist to intervene¹². In the past, restoring teeth with fluorosis could not be done conservatively¹³. Nowadays minimally invasive techniques are the preferred treatment options for children and adolescents¹⁴. Among these techniques, we have the dental bleaching and microabrasion associated with resin restoration.

The aim of this report is to present a conservative treatment performed in a child with severely compromised aesthetic appearance of the maxillary permanent teeth caused by fluorosis, associating three

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Figure 1. Intra-oral view of the maxillary central incisors with structural defects and generalized white spots in all teeth.



techniques in order to be minimally invasive, to obtain a more favourable aesthetic result and to preserve dental structure.

CASE REPORT

A 9-year-old girl was attended at the Continuous Education Pediatric Dentistry Clinics of the Federal University of Rio de Janeiro, Brazil, with the chief complaint being aesthetic problems in the anterior maxillary teeth. The patient's and her parents' desire was that she should have an aesthetically pleasing smile.

Her medical history was non-contributory and there was no family history of dental abnormalities. Intra-oral examination revealed generalized hypomineralized permanent teeth with opaque white spots. Both maxillary central incisors presented brown spots in the incisal and

middle thirds. The maxillary canines also presented this same pattern in the incisal region. She presented normal psychosocial behaviour, initially being introspective and in some situations, being ashamed of her smile and concerned about the brownish stains on her teeth.

A detailed history was obtained, with an emphasis on the possibility of having swallowed fluoride as child up to the age of 2 to 3 years of age. According to her mother, she usually hid away to eat the children's toothpaste (1100 ppm fluoride) because of its delicious taste, in addition to ingesting it every day during the tooth brushing until 4 years of age. Moreover, she lived in Rio de Janeiro, a region with water fluoridation (0.7 ppm fluoride). Based on the symmetrical and bilateral pattern of enamel hypomineralization and the presence of a contributory fluoride history, we confirmed the diagnosis of severe dental fluorosis according to Dean's classification¹⁵. All teeth were affected presenting white spots while maxillary central incisors presented structural defects and brown stains and pits in the incisal cuspides of maxillary canines and pre molars (Figure 1).

The option was to perform a more conservative treatment, comprising 3 steps: vital tooth bleaching and enamel microabrasion associated with composite resin restoration of the maxillary central incisors that were affected by structural defects and brown stains.

Although the mandibular teeth also presented dental fluorosis, they were not treated, since they did not affect the aesthetics of the smile and caused no pain.

TREATMENT

Initially, the brown stains on the maxillary central incisors and opaque white spots on the other teeth were treated with a home tooth whitening system (16% carbamide peroxide) for 3 weeks. During this period, the child was monitored as regards tooth sensitivity and pulp vitality, and was advised to avoid foods and drinks containing dyes. Vitality testing of the maxillary central incisors undertaken at each review appointment indicated no change in pulp

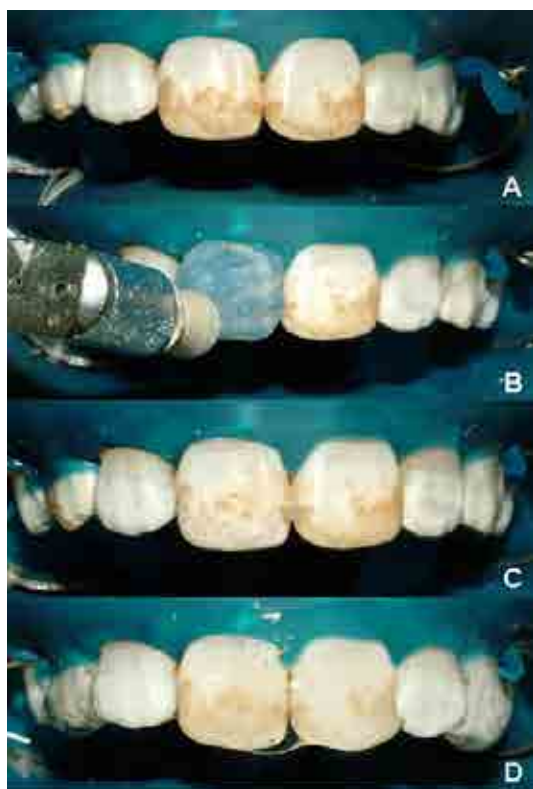


Figure 2. A - Intra-oral view of the maxillary central incisors after 3 weeks of take-home tooth whitening treatment. B - Technique of microabrasion with phosphoric acid 35% and pumice into a slurry with rubber cup prophylaxis. C - Post-treatment view of patient's anterior teeth after 3 sessions of microabrasion. D - Remineralization with topical fluoride.





Figure 3. Post-treatment intra-oral view showing the improved aesthetics following tooth whitening, microabrasion and resin restoration.

status. The aim of dental whitening was to uniformize the colour and resulted in slightly whitening the cervical region of the teeth (Figure 2A).

In the next step, teeth were microabraded, following the technique of the UK National Clinical Guidelines in Paediatric Dentistry¹¹. The maxillary central and lateral incisors and canines were isolated with a rubber dam and Vaseline was applied to the gingiva. The teeth were cleaned with pumice and water, washed and dried. A mixture of phosphoric acid 35% and pumice was put into a slurry, and a small amount was applied to the labial surface of affected teeth with rubber cup prophylaxis, using a low speed rotary handpiece, for five seconds (Figure 2B). The tooth surfaces were then washed for five seconds directly into the aspirator. Ten applications of the microabrasion paste were made, lasting 5 seconds each. After treatment, topical fluoride was applied for 3 minutes, to enhance remineralization (Figure 2D). This was repeated every week for another 3 sessions. Between the sessions, any degree of tooth sensitivity was reported.

In the review one week after the last session, the stained area was reduced in size but small brown areas persisted and the patient requested a further treatment session. Microabrasion significantly redu-

ced the brown stains and no tooth sensitivity was reported (Figure 2C).

The third step of the treatment was to restore the maxillary incisors and canines with composite resin, to improve the uniformity of tooth colour. It was not necessary to perform bevel or any other mechanical preparation (Figure 3).

The microabrasion and resin restoration techniques were performed under anaesthesia by papillary infiltration only. The patient was delighted with the aesthetic improvement and reported that she was smiling more often and feeling that she was integrating better with her friends. It was recommended to return for quarterly reviews.

DISCUSSION

With regard to the suggested hypotheses about how fluoride might alter enamel matrix formation, one possibility is that fluoride might specifically interact with ameloblasts to affect the synthesis and secretion of enamel matrix proteins and proteinases^{4,16}. Severe fluorosis is not a frequent occurrence, but dental fluorosis in general seems to be on the rise as a result of the increase in exposure to fluoride from all sources¹⁷. Dental fluorosis is a defect of enamel formation, in which fluoride ingestion during critical periods of enamel mineralization results in interference



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in the proper organization of the enamel proteins, their removal or their proper mineralization⁴.

In this clinical case, the final diagnosis of fluorosis was based on the clinical findings in addition to the detailed anamnesis. The symmetrical white spots scattered throughout the permanent maxillary incisors along the lines of perikymata were thus initially diagnosed and classified as fluorosis. These clinical features were associated with the history of chronic fluoride ingestion during the period of 2 to 3 years of age, which is the time of formation of these dental elements. It corroborates the findings of Hong *et al.*^{18,19}, who suggested that the most critical period for susceptibility to fluorosis in human maxillary central incisors corresponds to the first 24 months of age, and Evans *et al.*^{19,20} who reported the age range to be between 15 to 24 months for girls and 21 to 30 months for boys. These findings are also in agreement with those of Bardsen²⁰ (1999), who reported that children who ingest fluoride during the first two years of life have more chance of developing fluorosis in maxillary permanent incisors compared with those who were exposed after two years of age. Furthermore, fluorosis can not be attributed only to the form of fluoride use, because, although it is possible to quantify the fluoride present in toothpastes and the water supply, there are other sources that can increase total ingestion, such as teas⁶.

The aim of clinical management of tooth discolouration is to produce an acceptable cosmetic result as conservatively as possible²¹. According Periasamy *et al.*²² (2001), depending on the type and severity of the enamel defects, there are several options of treatment that range from simple selective polishing, bleaching and microabrasion to manufacturing porcelain crowns. It is important to consider that porcelain veneers were contraindicated at this time, due to the patient's immature gingival contour and pulpal size¹¹. In the clinical case presented, in spite of the serious compromise caused by the fluorosis, the choice was to associate bleaching, microabrasion and resin restoration. This association of treatments was successfully performed in order to preserve the dental

structure, correct surface enamel hypomineralization and colouring defects by removing superficial enamel^{21,23}. Microabrasion could be safely performed, since the maxillary central incisors presented complete root formation. Another advantage was performing these techniques under anaesthesia by papillary infiltration only.

Bleaching is often used after mechanical abrasion in an attempt to whiten the teeth when the white spot lesions remain problematic^{24,25} and to provide a more uniform colour. Microabrasion reduced the area and intensity of the black and brown stains. Nevertheless, when small brown areas persisted, it was decided to stop microabrasion in order to avoid exposing more subsurface hypomineralized enamel²⁶. Thus, the ability to remove the fluorosis-induced chalky spots in a conservative manner allowed the teeth to be restored with the use of a direct composite resin in an aesthetic and functional manner.

Lambert¹⁴ (2006) reported a conservative aesthetic solution for dental fluorosis in a 15-year-old girl, by means of microabrasion and resin restoration. However, a diamond bur was used to eradicate fluorosis and bevelling the surface to restore the tooth with composite resin afterwards. In this report, it was preferred to not perform this mechanical preparation because the young age of the child and to be minimally invasive, conserving as much of the dental structure as possible.

CONCLUSION

A successful conservative approach to dental fluorosis in a child was obtained with a combination of home tooth whitening and microabrasion techniques. Further improvement in aesthetics was achieved with composite resin.

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