CASE REPORT

Management of Hypocalcified Amelogenesis Imperfecta In Mixed Dentition: A Case Report

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ABSTRACT

Amelogenesis imperfecta (AI) is a genetic disorder characterized by incomplete or improper development of tooth enamel, the outer layer responsible for protecting teeth from decay and providing aesthetic appearance. Hypocalcification AI has the lowest incidence compared to hypoplastic AI and hypomaturation AI. This condition can cause enamel defects, affecting tooth function, appearance, and individuals' psychosocial well-being, including children. The treatment plan comprised non-invasive and invasive approaches. A microabrasion technique was performed to remove yellowish-brown discoloration. On the next visit, invasive treatment was provided, which was direct composite veneer restoration. Awareness of AI's clinical features is important for early identification and successful treatment. Dental professionals can accurately diagnose and develop appropriate treatment plans by recognizing signs and symptoms.

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INTRODUCTION

Amelogenesis imperfecta (AI) is an inherited disorder that primarily affects the outer layer of the teeth, known as the enamel.(1–3) This condition occurs in an estimated frequency of approximately 1 in 700 to 1 in 14,000 individuals.(2,3) AI shows developmental changes in enamel structure without any systemic disturbances. Hypoplastic AI represents 60-73% of all cases, hypomaturation AI represents 20-40%, and hypocalcification AI represents 7%.(3) In short, enamel formation can be divided into three stages: matrix formation, during which proteins essential for amelogenesis are synthesized; calcification, characterized by the deposition of minerals and subsequent removal of most proteins; and maturation, when the newly mineralized enamel completes its calcification and the residual protein is eliminated. (4,5) Witkop and Sauk(1–3) categorized various types of AI based on decreased enamel amount (hypoplasia), inadequate calcification (hypocalcification), or incomplete enamel maturation (hypomaturation). They also acknowledged the presence of combined defects. (1–3)

In this case, anamnesis results revealed that there is a family history of the same condition as the patient, indicating a hereditary factor as the etiology of amelogenesis imperfecta hypocalcified. In hypocalcification type amelogenesis imperfecta, the structure of the enamel matrix has no abnormalities, however, during the calcification stage, the teeth are not calcified properly, which gives the teeth a normal clinical appearance at the start of eruption but have very soft and brittle enamel. On eruption, the enamel may be yellowish brown or orange, but it often becomes stained brown to black with calculus deposition. With time, coronal enamel is chipped more than a cervical portion.(2)

Dental problems in AI include sensitive teeth and poor appearance due to tooth loss and staining. The rough enamel surface makes cleaning more challenging, potentially leading to gingivitis and periodontitis. Since AI affects both primary and permanent dentition, it is

important to educate parents and ensure regular patient reviews to prevent future dental problems.(1) This paper aims to report on management of AI patients during the mixed dentition stage.

CASE REPORT

A 10-year-old girl came to the Pediatric Dentistry Clinic at RSGM Unpad with her parents, complaining of yellowish teeth that were affecting her appearance. There is no tooth sensitivity. Intraoral clinical examination revealed yellowish-brown discoloration on the labial and occlusal surfaces of teeth 11, 12, 16, 21, 22, 26, 33, 34, 35, 36, 43, 44, 45, 46, and dentin caries in the pit and fissure areas of occlusal surfaces of teeth 36 and 46 (Figure 1). The parents stated that the condition began when her permanent teeth were erupting. Family history indicated similar conditions in the patient's father, younger sibling, and paternal relatives (Figure 2).

Figure 1: Intraoral clinical photos before treatment.

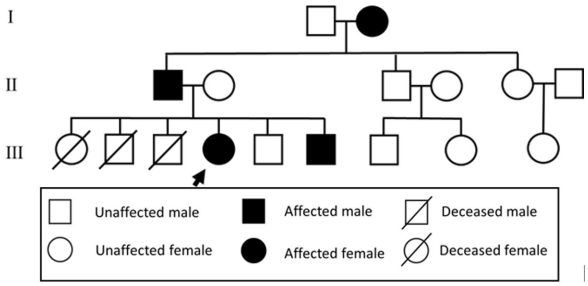

Figure 2: Pedigree chart of the case.

CASE MANAGEMENT

Diagnosis and etiology

After evaluating the patient's condition through anamnesis, clinical examination, and radiographic examination, a diagnosis of hypocalcified type IIIA amelogenesis imperfecta is established. Considering the family history of similar conditions, the cause of this dental developmental defect is determined to be genetic factors.

Microabrasion treatment

The first treatment was performed on Friday, May 23, 2023, at the Pediatric Dentistry Clinic at RSGM Unpad. The chemical microabrasion material to be used for this case is Opalustre (Ultradent, USA), which contains 6.6% hydrochloric acid slurry with silicon carbide microparticles. This material is available in a purple-colored syringe. Proper isolation is crucial; therefore, both the operator and the patient should wear protective goggles.

A gingival protector was applied to cover the gingiva during the treatment. In this case, the gingiva was protected using a light-cure gingival protector from Heydent (JW Liquid Dam) along the gingival margin of the 12-22 region before the procedure to prevent tissue damage. The gingival protector was applied 2 millimeters along the gingival edge and extended approximately 0.5 millimeters onto the enamel surface to protect the interdental papilla and cured. After that, the working area was isolated using a rubber dam.

Prepare the Opalustre microabrasion material (Ultradent, USA), and apply Opalustre (Ultradent, USA) to the labial surface of the discolored teeth with a thickness of 1 mm. The tooth surface is abraded using a bristle cup with light pressure and low speed for 60 seconds (Figure 3), then rinsed. During the initial visit, microabrasion is performed 7 times with low to medium hand pressure. After 5 applications of Opalustre (Ultradent, USA), the yellowish discoloration on teeth 11 and 21 is still noticeable but starting to fade. Apply Casein Phosphopeptide Amorphous Calcium Phosphate (CPP-ACP) on teeth 11 and 21 to aid in the remineralization process. The patient is instructed to rinse with a mouthwash containing 0.05% NaF active ingredient to enhance remineralization on the enamel surface, and a follow-up appointment is scheduled for 1 week later. This mouthwash is chosen because it is available over the counter at an affordable price.

The second visit was conducted on Tuesday, May 30, 2023. After evaluating teeth 11 and 21, it was decided to perform microabrasion again. The microabrasion procedure was conducted similarly to the previous visit, but with medium to hard hand pressure applied four times. The enamel surface becomes smooth and glossy.

Restorative treatment

The next visit was scheduled for Thursday, June 15, 2023. The patient arrived without any complaints. Clinically, the appearance of teeth 11 and 21 was satisfactory, and it was decided not to repeat the microabrasion procedure. Full direct composite veneers were applied to teeth 12 and 22 using HarmonizeTM nanohybrid universal composite by Kerr.

Teeth 12 and 22 were prepared using a super-fine fissure tapered-flat-end diamond bur. The preparation was limited to removing the discolored yellow-brownish portion of teeth 12 and 22. After the filling was completed, the restoration shape was refined and enamel recontouring was performed using a super-fine fissure tapered-flat-end bur. This was followed by polishing using Eve Diacomp Twist Composite Polishing medium and fine. The completed esthetic restoration was well sealed.

On Thursday, June 22, 2023, the patient came for their first follow-up appointment. The patient reported no complaints. Clinical examination of teeth 12 and 22 showed that they were in good condition and there was no food retention (Figure 4).

Figure 3: Microabrasive procedure.

Figure 4: Final result of microabrasion and full veneer direct composite restoration.

DISCUSSION

Tooth structure enamel malformation, such as enamel hypocalcified can present esthetic problems.(1) In this case report, the patient came with a complaint of yellowish teeth and feeling embarrassed in front of their friends. According to the patient's parents, the yellow color occurred when their permanent teeth first erupted. Anamnesis results revealed that there were no complications during pregnancy, childbirth, and neonatal periods, such as maternal illness, delivery complications, prematurity, and low birth weight. Similarly, the patient did not have any childhood illnesses, including respiratory problems, fever, hospitalization, or antibiotic therapy. In hypocalcified type, the enamel matrix is laid down appropriately, but deficient calcification processes cause proper shape on eruption but very soft and friable enamel. On eruption, the enamel may be yellowish brown or orange, but it often becomes stained brown to black with calculus deposition. With time, coronal enamel is chipped more than a cervical portion. Type IIIA, is diffuse autosomal dominant (AD) and the mutated gene is FAM83H.(1,5) The patient's parents want an affordable treatment.

Microabrasion of the enamel is chosen as the treatment option because the main indications are intrinsic discoloration or texture damage due to enamel hypoplasia, amelogenesis imperfecta, or fluorosis. Enamel microabrasion is a conservative method for removing enamel to improve discolorations limited to the outer enamel layer. However, in some cases the enamel defect cannot be resolved with microabrasion because it penetrates deeper into the enamel (or perhaps even includes the dentin), and a resin-based composite restoration can be accomplished. The contraindication for microabrasion is in patients who cannot fully close their lips, where the teeth are constantly exposed to air and are more prone to dehydration, resulting in the underlying layer beneath the enamel not being adequately hydrated. In such conditions, color changes in the teeth are more noticeable, and this can be a characteristic of microabrasion failure, requiring orthodontic treatment before addressing the issue. In this case report, the first microabrasion treatment was performed using low to medium hand pressure. However, in the second treatment, medium to hard hand pressure was applied. The results obtained were different, as microabrasion performed with medium to hard pressure yielded more significant results. However, the patient reported experiencing more sensitivity during the second treatment compared to the first treatment, but it was still manageable without local anesthesia.

Most research studies on microabrasion are conducted in combination with bleaching. Some studies suggest that after enamel microabrasion, it is recommended to perform dental bleaching with carbamide peroxide or hydrogen peroxide for certain cases. This is because enamel microabrasion results in micro-reduction of the enamel surface. Teeth that have undergone microabrasion may experience color changes, becoming darker or more yellowish after treatment, as the remaining enamel surface is slightly thinner and more transparent, allowing the dentin to become more visible. Therefore, after microabrasion, patients are asked to return for a follow-up visit after 2 weeks to allow sufficient time for enamel surface remineralization with accompanying optical improvement. Similar cases by Pereira R, at all.(4) were reported, in this specific clinical case, careful consideration should be given, especially since the patient was 10 years old. Young patients often have a relatively large pulp chamber and high pulp horns that are close to the dentin, posing a potential risk of experiencing severe sensitivity.(4) Therefore, dental bleaching was not performed in this case report. After evaluating different techniques, concluded that microabrasion followed by polishing with diamond paste or fluoride prophylactic paste provided higher hardness and better surface smoothness of the enamel. In 1997, through an in vitro polarized microscopic study, showed that enamel after microabrasion technique is more resistant to demineralization than untreated enamel surfaces. In addition, it was observed that there is less colonization by Streptococcus mutans on microabraded enamel.

Full veneer direct composite restoration, where the entire labial surface is covered with resin, was chosen as the treatment option. Direct restoration with composite resin is a highly conservative and cost-effective

treatment alternative that can be performed with minimal intervention, while still providing excellent mechanical, aesthetic, and functional properties.(4) Glycerine-based gel was applied to the surface of the composite resin to enhance the monomer conversion rate and serve as an oxygen inhibition layer remover, followed by light curing for 20 seconds. Restoration's finishing and polishing were performed for dental contouring regularization. Polishing discs are used for rounding the edges and creating line angles. In the case presented, the final surface was polished without removing the textures by using only an Eve Diacomp Twist Composite Polishing in dry conditions. At the first follow-up visit, the restoration was found to be in good condition, characterized by a smooth surface, absence of cracks or detachment, and no food retention on the restoration.

CONCLUSION

Awareness of AI's clinical features is pivotal for early identification and successful treatment. Dental professionals can accurately diagnose and develop appropriate treatment plans by recognizing signs and symptoms.

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