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Case Report

Aesthetic and Functional Rehabilitation of the Mixed Dentition Affected by Amelogenesis Imperfecta

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Abstract: *Case Report*: Two female patients aged 8 and 9 years old with amelogenesis imperfecta (AI) reported unsatisfactory aesthetics, difficulty in mastication, and dental hypersensitivity. The clinical examination observed mixed dentition with antero-posterior malocclusion and anterior open-bite. A hypocalcified form of AI was diagnose. A multidisciplinary management plan was performed and divided into preventive, restorative, and prosthetic and interceptive stages. Initially, preventive treatment was implemented, with fluoride varnish applications, in order to reduce the dental sensitivity. In the second stage, in the posterior teeth, stainless steel crowns were performed with minimally invasive dental preparation. Direct composite resin restorations were used to improve the appearance of anterior teeth. Finally, the follow-up was programmed to control restoration's integrity, oral hygiene. Conclusion: Successful reduction of the dental hypersensitivity and improvement of the aesthetic and functional aspects as well as quality of life were observed.

Keywords: Amelogenesis Imperfecta; Mixed Dentition; Restorative Treatment; Oral Rehabilitation.

INTRODUCTION

Amelogenesis imperfecta (AI), known as congenital enamel hypoplasia, is a hereditary defect of tooth development affecting both primary and permanent teeth [1].

AI can be inherited as an autosomal dominant, autosomal recessive, X-linked recessive; or as a result of spontaneous mutation in patients who have no family history of AI [2-4]. Amelogenesis imperfecta has been divided into four main types (hypoplastic, hypocalcification, hypomaturative and hypomaturation-hypoplastic with taurodontism) with 14 subtypes based on clinical, radiographic and genetic factors [5]. According to literature all types have similar oral characteristics as: accelerated dental development, dental impaction, missing teeth, crown and root resorption, pulp calcification and anterior open bite [6-8]. Potential clinical implications of AI include rapid attrition, excessive calculus deposition, and gingival hyperplasia, which lead to teeth sensitivity, poor esthetics and reduced self-confidence specially [9, 10].

Rehabilitation is complex and requires a multidisciplinary approach. Objectives of the treatment are to reduce sensitivity protect the tooth structure from wear, establish good oral hygiene habits, and restore function and esthetic to improve the patient's quality of life.

The aim of this article is to report a rehabilitation treatment by noninvasive treatment and multidisciplinary approach of two pediatric patients with hypocalcified form of hereditary AI.

Case 1 presentation

An 8-year old girl was referred to the pediatric Dentistry clinic of Monastir with chief complaints that included extreme tooth sensibility, she expressed extreme dissatisfaction with her appearance teeth and her mother confirmed that other children, due to her teeth, teased the patient. She expressed dissatisfaction with tooth size, shade and shape and a severe overbite with a poor chewing function.

There was a history of consanguineous marriage. The family was further questioned about the presence of similar abnormalities in the family, they confirmed the same aspect found in her brother, father and grandmother.

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There is no systemic disorders and renal ultrasound showed no abnormalities. The extra oral examination showed unequal distribution of facial thirds. The lower third of the face appeared to be longer.

The initial intraoral examination showed poor oral hygiene due to hypersensitive teeth, a red and swollen gingiva as well as heavy plaque deposits (Fig. 1).

Fig-1: Intraoral examination

The individual tooth examination showed generalized defective enamel with yellow brown, rough surfaces and exposed dentine. An overbite was noticed in both anterior and posterior regions with lingual interposition.

Before starting the treatment, the patient was informed for the diagnosis. All the treatment modalities of full mouth rehabilitation were explained to patient and parents and their consent was obtained. The treatment planning was based on preserving the remaining tooth structure until the patient can receive a definitive treatment. The goal is to relieve the symptoms, improve the occlusion and esthetic demands.

In the first step, the patient was placed on intensive oral hygiene program, including scaling, reinforcement of oral hygiene and application of sodium fluoride varnish. After 3 weeks, the level of oral hygiene maintained by the patient was acceptable with soft tissues improvement.

The second step consisted on the reconstitution of 1st permanent molars using stainless steel crowns with taking attention to not aggravate the open bite. Stainless steel crowns were sealed using glass ionomer cement.

The upper anterior teeth were restored in composite resin with strip crowns (transparent celluloid crown forms). The suitable size of strip crown was selected and trimmed with fine scissors to fit the tooth in length and cervical adaptation. After etching and applying the primer. The strip crown was filled with composite resin, carefully positioned on the tooth and the excess removed. After light curing on each surface, the strip crown was peeled off or cut than the surface was polished (Fig.2).

Fig-2: Upper incisives restoration

A model cast of upper and lower teeth was done aiming to guide the position of lower restorations. The role of wax up was to decrease the degree of open bite for an optimal esthetic. A thermoformed gutter was made on wax up cast. The gutter was then filled and positioned on lower incisors. After light curing, the gutter was removed and teeth were separated then polished (Fig.3).

Fig-3: Lower incisives restoration

An overdenture was indicated for esthetic rehabilitation, as a potential space maintainer and to correct posterior open bite.

Hence, maxillary and mandibular impressions were made with alginate by using custom trays. A semi-adjustable articulator were registered, and adjusted in 15° for the Bennett angle and 30° for the path of condylar angle. The maxillary cast was mounted by using face-bow record. The mandibular cast was mounted in centric relation (CR) to the maxillary cast by using a silicone-based interocclusal CR record which was obtained by bilateral manipulation technique from the patient in CR (Fig.4).

Fig-4: Overdenture conception

The vertical dimension at rest (VDR) was obtained by marking two reference points on the patient's nose and chin. The patient was asked to swallow several times and then relax his jaws. Then phonetic pronunciation was tested, and the distance between the references was measured.

Case 2 presentation

A nine-year-old girl attended with her mother after she was referred to Department of Pediatric and Preventive Dentistry at the Faculty of Dental Medicine of Monastir for evaluation and treatment. The main chief complaints were hypersensitivity and yellow teeth.

Fig-5: Post rehabilitation

There was a history of consanguineous marriage. Neither the parents nor her brothers and sisters seemed to be affected. No medical history of systematic pathologies were report. Furthermore, bullying in the house was occurring by the sibling due to her teeth appearance affecting the patient social life.

A written informed consent was obtained from the child's parents for all imaging exams, for the treatment modalities and for the data publications. A detailed extra and intra-oral clinical examination and were performed (Fig. 6).

Fig-6: Extra-oral examination

The patient presented a mixed dentition stage, a red swollen gingiva along with a poor oral hygiene. A previous stainless steel crown were sealed on all deciduous molar.

The individual tooth examination showed yellow-brown defective enamel with rough surfaces and exposed dentin. The left upper incisive presented on the buccal face a slow-evolution caries with dark-brown coloration and a hard surface.

A third degree mobility was found on the first upper left deciduous molar. The patient was hypersensitive to air and water stimulations. There was no loss of occlusion-vertical-dimension. The patient presented a slight anterior open-bite.

The features obtained from clinical examination were consistent with a possible diagnosis of hypocalcified with generalized chronic plaque-induced gingivitis and anterior open-bite (Fig. 7).

Fig-7: Intra-oral examination

As precautionary measure, information about nephrocalcinosis syndrome possibility was given and patient was advised to attend the department of radiology and nephrology. Renal ultra-sonography did not show any abnormalities.

The treatment planning was divided into 3 stages. Priority was given to reducing hypersensitivity and improving patient's oral hygiene. The second phase was to provide full-coverage restorations to improve aesthetic and masticatory function. The final stage of treatment was the management of the anterior open-bite.

For the preventive phase of oral management, a prophylactic brushing using gingival adapted toothpaste (Parodontax) was done. Along with, a weekly application of sodium fluoride for a month to reduce hypersensitivity, to protect remaining structure and to prevent future loss and caries development.

The second phase of treatment consisted on dental restorations and reconstitution. Reinforcement of oral hygiene was performed every single appointment due to non-motivation of the patient. The upper and lower first permanent molar were minimally prepared to receive stainless steel crowns by elimination of contact zone and occlusal reducing.

For the anterior teeth, resin composite direct reconstitution technic was chosen. Preparation involved smoothing of surface irregularities. Then, reconstitution was performed under rubber dam isolation with a RC (Itena A2). Polishing was accomplished using finishing and polishing Sof-Lex discs and strips (3M ESPE) (Fig. 8).

Fig-8: Post-restoration

The last phase of oral rehabilitation was the management of the anterior open-bite. A soft device was decided. A functional education device Class II (EF Line Orthoplus) was given to the girl patient. The patient was called every moth to control and oral hygiene reinforcement.

The girl patient as well as her mother was very satisfied with the oral management outcome. The dental sensitivity was relieved, the masticatory function was better. Aesthetics and social life were improved.

The mother was informed that strict oral hygiene must be maintained; also, these treatments were temporary until the girl get to the age of periodontal maturity when she can get definitive care approach.

DISCUSSION

When they were referred, the two patients presented aesthetic, functional and psychological problems.

Psychosocial impact

Patients affected by amelogenesis Imperfecta had higher levels of social avoidance, distress and lower mastery and self-esteem [11]. Oral rehabilitation can improve psychosocial condition of amelogenesis imperfecta patients especially if restorative treatment were done before adolescence [12]. Especially, the two patients reported bullying either in home or at school due to their dental aspect.

Treatment plan

The solution of definitive oral rehabilitation in an adult age was not reasonable. Accordingly, a transitional treatment planning individualized was decided based on every patient's needs, age, and amelogenesis imperfecta type [13].

In the mixed dentition, treatment goals are to preserve tooth structure and vitality, decrease dental sensitivity, malocclusion and improve aesthetics until the patients reach the age they can receive definitive treatment.

Yet, oral management in mixed dentition is complex since definitive treatment can't be delivered until complete eruption of permanent dentition. Several treatment options/modalities have been advocated: stainless steel crowns, polycarbonate crowns, onlays, overdentures, and/or direct or indirect composite resin [14-18].

Preventive phase

Patients with AI present a thinner and more fragile enamel leading to a dental sensitivity and a more susceptibility to enamel fractures. To improve this condition, the first stage of treatment was the preventive approach with 22,600 ppm of sodium fluoride. After four weeks, the patient related relief of the sensitivity. It

was in accordance with data of the literature. Petersson L.G. *et al*. presented in a review study that the fluoride preparations in combination with dentin fluid obstruction agents are beneficial to reduce the dental sensitivity. The fluoride's main mechanism of dental sensitivity's relieve is its chemical ability to reduce and block fluid movements in the dentin tubules through formation of calcium-phosphorous precipitates as well as calcium fluoride and fluorapatite [19].

Posterior teeth restoration

The stainless steel crowns placement present a number of excellent advantages, i.e. a minimal tooth preparation according to minimal intervention dentistry; prevention of caries development and dental loss.

SSC are reported to be the most effective and efficient way of restoration preserving marginal tissue from fracture.

Therefore, it is advisable to protect first permanent molars and even deciduous molars just after eruption. Authors has reported a high caries-risk and dental loss in population affected by amelogenesis imperfecta [20]. Additionally, stainless steel crowns can improve masticatory function among children with amelogenesis imperfecta [21].

Anterior teeth restoration

Aesthetic restoration has a high importance in improving psychology and social integration among pediatric patients suffering from amelogenesis imperfecta.

Composite restorations seemed to be a good compromise aesthetic and minimally invasive as transitional restorations until bone and soft tissue maturation. Yet, a high failure rate was reported associated with insufficient bonding between the composite resin and the enamel [13].

Acrylic resin crowns or polycarbonate crowns were used to restore anterior teeth. They are esthetically acceptable and not expensive. Even when there is no sufficient enamel for bonding, acrylic crowns or polycarbonate crowns are likely to be helpful for anterior teeth, particularly in the mixed dentition [22].

However, their use in AI teeth has not been systemically evaluated [23]. Strip crowns and direct composite remain efficient restorations and were chosen for sibling's cases.

Removable partial denture or overdenture

An overdenture is supported both by soft tissues and dental tissues (roots or modified teeth). This appliance offer a solution to a complex prosthodontic problem with a possibility to be altered and a possibility to make adjustments to keep up with growth and development of the child's jaws. Renner R. *et al*. reported a case which was successfully treated by maxillary overdenture [24].

The first patient presented an anterior and posterior open-bite which is a feature of the amelogenesis imperfecta. A removable partial denture/overdenture was decided. An overdenture is supported both by soft tissue and the remaining roots or modified teeth. It provides a solution to a complex prosthodontic [24].

Orthodontic treatment

Children affected by AI often need orthodontic management due to dental and/or skeletal problems. Managing the defective enamel, which may or not withstand the force that applied during the treatment and when removing the appliances, is a challenge of using fixed orthodontic appliances [25].

Early orthodontic treatment using removable appliances with soft forces applied to the dento-alveolar tissues may be a good alternative to the dental problems and may facilitate skeletal problems' management. In our two cases, removable devices were used to improve the arches relationship.

CONCLUSION

Amelogenesis imperfecta is a group of dental inherited disorders that pose diagnostic and restorative treatment challenges for dental care providers. Early diagnosis with appropriate oral management is crucial in preventing the progressive deterioration of dentition, the masticatory dysfunction and the negative psychological impact on the child. Unfortunately, there is currently no standard of care established for managing patient with such lesion. The treatment approach should be individualized depending on the patient's needs to optimize his oral health and long-term prognosis. The management of AI-affected patients requires the patients' and parents' motivation throughout the growth period, with successive and long treatment phases at each dentition stage. Finally, in these patients, as described in most cases, the positive psychosocial impact was noticeable. After the rehabilitation, the two siblings had become more self-confident and smiled more.

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