

The management of patients with amelogenesis imperfecta

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Abstract

Amelogenesis imperfecta (AI) refers to a genetically based hereditary disorder characterized by defective enamel formation. Esthetic treatment of patients with AI presents a challenge in clinical practice. The practitioner should select the appropriate treatment modality, which is determined mostly by the type of AI. In this paper we will detail the therapeutic options for patients with amelogenesis imperfecta depending on the type of damage.

Keywords: Amelogenesis Imperfecta; Esthetic; Amelogenesis imperfecta local hypoplastic form

1. Introduction

Amelogenesis imperfecta (AI) is a genetically based hereditary disorder characterized by defective enamel production [1].

The normal tooth structure is composed of three layers which are the enamel covering the crown, the cementum covering the root, the inner layer of the dentin and a central tissue represented by the pulp which consists of arteries, veins and nerves [2].

Tooth's external appearance due to changes in its optical characteristics and light-transmitting ability may be led by the alteration of the composition of these structures like in AI.

Patients with AI are self-conscious about their unattractive smiles and experience significant discomfort as a result of dentin exposure [3].

The difficulty of restoring anterior teeth with AI is mostly determined by the degree of the problem.

Thus, in order to restore the esthetics and function of patients with AI, it is necessary to properly examine and diagnose the kind of AI as well as the intraoral condition in order to choose the optimal management strategy for the patient's needs. In some circumstances, a mix of therapy modalities would be required to achieve the desired therapeutic outcome.

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The purpose of this article is to provide a review of the classification, clinical aspects, and numerous therapeutic choices for AI management.

2. Classification of AI

The obsolete AI categorization system recognized four phenotypes based on phenotype and manner of inheritance (Table 1):

Table 1 Classification of amylogenesis imperfecta [3]

Classification	Criteria
type I : hypoplastic	Is caused by a deficiency in enamel matrix development and shows a lack in the amount of correctly mineralized enamel. The enamel appears hard and gleaming but is deformed with pits on the enamel surface. In a severely worn dentition, the dentin is uncovered, discolored, and sclerotic. The enamel seems thin on radiographs.
type II : hypomaturation	When compared to normal enamel, this hypomaturation is attributable to a higher retention of enamel matrix proteins (2-5 percent vs 0.01-1 percent for normal enamel). It has a mottled appearance with discolorations that range from opaque white to yellow-brown or red-brown. The softer enamel wears away from the dentine beneath it. The enamel looks normal on radiographs.
type III : hypocalcified	It is characterized by a weak, very thin, and friable enamel that is commonly discolored (yellow to dark brown), has a chalky dull coloration or a cheesy consistency with a normal shape on eruption, and can be easily detached from the dentin. Tooth wear is visible and gets worse with age. The enamel seems thin on radiographs.
type IV : hypomaturation/hypoplasia/taurodontism	Is the result of combining Types I and II. The enamel is often thin, with or without extended pulp chambers.

3. Clinical aspect of AI

Patients with AI frequently present undesirable smiles and experience significant sensitivity as a result of excessively uncovered dentin zones and pulpal troubles.

In addition, in patients with AI, space anomalies due to loss of vertical dimension caused by tooth tissue loss and short clinical crowns are very frequent.

As a result, AI can be linked to a number of anomalies[3]:

- Teeth agenesis.
- Crown anomalies that result in hypoplastic teeth and short crowns due to enamel deficiencies. This might cause horizontal space issues by increasing or reducing space due to numerous diastemas or tooth movement in addition of vertical space issues because of a reduced vertical dimension of occlusion due to short crowns and higher risk of attrition due to poor enamel quality and quantity.
- Root anomalies like taurodontism in type IV of AI with an expanded pulp chamber because of dysplastic root dentine and pulpal calcification resulting in endodontic complications.
- Periodontal disease: such as tooth sensitivity mainly caused by poor oral hygiene resulting in a rise in plaque and bleeding indices.

4. Treatment considerations

Treatment objectives [4]:

The treatment objective is determined depending on the phase of dentition:

- Temporary phase — therapy is carried out throughout the primary and mixed dentition with the purpose of facilitating the emergence of permanent teeth.
- Transitional phase – since all permanent teeth have erupted until adulthood: dental therapy for these patients focuses on preserving tooth tissue, reducing tooth sensitivity, maintaining tooth vitality, vertical dimension, and restoring esthetical appearance.
- Permanent phase – starts in adulthood: The goal of dental therapy in this stage is to reduce tooth sensitivity, restore the vertical dimension of the occlusion, and improve function and esthetics.

Treatment options for AI include:

With advancements in ceramic systems and increased availability of diverse dental materials, the dentist has a wide range of options for treating AI patients: 5

- Direct restorations: with amalgam, glass ionomer cement, composite resins, resin-modified glass ionomer cement.
- Indirect restorations: with composite resin or ceramic veneers, Onlays, Overlays, veneerlays, and full-crown restorations.

To restore the appearance and function of patients with AI, the dentist should select the appropriate treatment option, which is determined mostly by the type of AI, the intraoral condition, and the severity of the disorder.

4.1 Hypoplastic AI

The restoration of anterior teeth with hypoplastic AI is mostly dependent on the severity of the pathology. Thus, the enamel layer should be recognised and differentiated from the underlying dentin.

In the literature, various studies have shown that composite resin restorations and porcelain veneers can be bonded to hypoplastic AI-affected enamel to cover discoloration and improve crown morphology [6].

According to Susanne Strauch and al, indirect restorations in individuals with AI have a high success rate and a significant durability. ⁵

In some circumstances, full-coverage crowns are recommended when repairing teeth with hypoplastic AI and extreme tooth sensitivity. The cementation of porcelain veneers is jeopardized when the enamel layer is very thin. Furthermore, repairing teeth with hypoplastic AI with porcelain veneers is sometimes insufficient to disguise the discoloration as portions of the underlying tooth structures may be rather dark and so the translucent nature of these restorations might result in poor esthetics of the reconstructed teeth. Although intrinsic opaque porcelain layers added into the restoration or opaque resins used during cementation might help to hide this, it often results in a loss of translucency, which detracts from the final esthetics.

4.2 Hypomaturation AI

In this type, the enamel is porous and has a mottled look as well as opaque white to yellow-brown discolorations. Thus, it is necessary to remove it during tooth preparation making ceramic veneers not recommended as a treatment option. The loss of enamel and exposure of dentin may interfere with good adhesive bonding resulting in restoration failure. Although that, some authors have used porcelain veneers as a treatment choice in dealing with hypomaturation AI. ⁶

4.3 Hypocalcified AI

The enamel, in hypocalcified AI, is not strong enough to hold a bond. Although the composite resin restorations may show a successful result in short-term, their prognosis in long-term is uncertain since the enamel may fracture resulting in deficient margins and altered restorations. In this type, full crowns are highly suggested after periodontal stabilization and endodontic treatment in case of pulp exposure due to acute attrition or excessive tooth reduction [5].

In general, management of this type of AI require a multidisciplinary approach involving many disciplines including restorative dentistry, orthodontics, periodontics, and orthognathic surgery in cases of severe malocclusion, followed by full prosthetic rehabilitation to achieve a sufficient functional and esthetic result.

5. Conclusion

Therapeutic options could be helpful for the management of patients with amelogenesis imperfecta depending on the type of damage.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest among authors.

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