INTERNATIONAL SEVEN JOURNAL
OF MULTIDISCIPLINARY
ISSN: 2764-9547

TREATMENT OF AMELOGENESIS IMPERFECTA: RESTORATIVE AND FUNCTIONAL APPROACHES

TRATAMENTO DA AMELOGÊNESE IMPERFEITA: ABORDAGENS RESTAURADORAS E FUNCIONAIS

TRATAMIENTO DE LA AMELOGÉNESIS IMPERFECTA: ENFOQUES RESTAURADORES Y FUNCIONALES

https://doi.org/10.56238/isevmjv4n6-014

Receipt of originals: 11/09/2025 **Acceptance for publication:** 12/09/2025

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ABSTRACT

Amelogenesis imperfecta (AI) is a hereditary disorder that compromises the formation of dental enamel, affecting function, esthetics, and patients' quality of life. This narrative review aimed to synthesize the main restorative and functional strategies described in the literature for managing AI. The literature search was conducted in the PubMed database, prioritizing publications from the past five years. The analyzed studies show that, in primary and mixed dentition, provisional treatment with stainless-steel crowns and direct restorations is essential to protect dental structure and preserve the vertical dimension of occlusion. In adolescents and young adults, direct and indirect restorative options, such as prefabricated veneers and ceramic crowns, provide good esthetic and functional outcomes. In more complex cases, full-mouth rehabilitation with an increased vertical dimension—especially using lithium disilicate crowns—demonstrates high predictability and durability. The literature also highlights the importance of a multidisciplinary approach and longitudinal planning. It is concluded that AI treatment must be individualized, considering age, phenotype severity, and functional demands, prioritizing structural preservation, esthetics, and full restoration of oral function.

Keywords: Amelogenesis Imperfecta. Restorative Treatment. Oral Rehabilitation.

RESUMO

A amelogênese imperfeita (AI), trata-se de uma desordem de fator hereditário que compromete a formação do esmalte dentário, afetando função, estética e qualidade de vida dos pacientes. Esta revisão narrativa teve como objetivo sintetizar as principais estratégias restauradoras e funcionais descritas na literatura para o manejo da AI. A busca bibliográfica foi realizada na base PubMed, priorizando publicações dos últimos cinco anos. Os estudos analisados mostram que, na dentição decídua e mista, o tratamento provisório com coroas de aço inoxidável e restaurações diretas é fundamental para proteger a estrutura dentária e preservar a dimensão vertical de oclusão. Em

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adolescentes e adultos jovens, recursos restauradores diretos e indiretos, como facetas pré-fabricadas e coroas cerâmicas, apresentam bons resultados estéticos e funcionais. Nos casos mais complexos, a reabilitação oral completa com aumento da dimensão vertical, especialmente com coroas de dissilicato de lítio, demonstra alta previsibilidade e durabilidade. A literatura também ressalta a importância da abordagem multidisciplinar e do planejamento longitudinal. Conclui-se que o tratamento da AI deve ser individualizado, levando em consideração idade, severidade do fenótipo e demandas funcionais, priorizando a preservação estrutural, a estética e o restabelecimento integral da função oral.

Palavras-chave: Amelogênese Imperfeita. Tratamento Restaurador. Reabilitação Oral.

RESUMEN

La amelogénesis imperfecta (AI) es un trastorno de origen hereditario que compromete la formación del esmalte dental, afectando la función, la estética y la calidad de vida de los pacientes. Esta revisión narrativa tuvo como objetivo sintetizar las principales estrategias restauradoras y funcionales descritas en la literatura para el manejo de la AI. La búsqueda bibliográfica se realizó en la base PubMed, priorizando publicaciones de los últimos cinco años. Los estudios analizados muestran que, en la dentición temporal y mixta, el tratamiento provisional con coronas de acero inoxidable y restauraciones directas es fundamental para proteger la estructura dental y preservar la dimensión vertical de oclusión. En adolescentes y adultos jóvenes, las opciones restauradoras directas e indirectas, como carillas prefabricadas y coronas cerámicas, ofrecen buenos resultados estéticos y funcionales. En los casos más complejos, la rehabilitación oral completa con aumento de la dimensión vertical—especialmente con coronas de disilicato de litio—demuestra alta predictibilidad y durabilidad. La literatura también destaca la importancia de un abordaje multidisciplinario y del planeamiento longitudinal. Se concluye que el tratamiento de la AI debe ser individualizado, considerando la edad, la severidad del fenotipo y las demandas funcionales, priorizando la preservación estructural, la estética y el restablecimiento integral de la función oral.

Palabras clave: Amelogénesis Imperfecta. Tratamiento Restaurador. Rehabilitación Oral.

1 INTRODUCTION

Amelogenesis imperfecta (UA) constitutes a heterogeneous group of inherited disorders that affect tooth enamel formation in both dentitions, with no evidence of other associated systemic alterations (Novelli et al., 2021; Roma et al., 2021). The prevalence of this condition varies significantly among different populations, ranging from 1:700 to 1:14,000 (Lundgren; Dahllöf, 2024). Classically, IA is categorized into four main phenotypes based on clinical appearance and enamel developmental defect: hypoplastic (type I), hypomatured (type II), hypocalcified (type III), and hypomature-hypoplastic with taurodontism (type IV) (Novelli et al., 2021; Chen et al., 2024; Herrera-Rojas; Perona-Miguel de Priego, 2023). The different presentations of amelogenesis imperfecta result in a diversity of clinical manifestations and hereditary patterns. These conditions can occur both in autosomal dominant and recessive patterns and in variants associated with the X chromosome, which reinforces the genetic complexity behind the condition (Cunha et al., 2022).

The clinical manifestations of UA are diverse and profoundly impact the quality of life of patients. Affected teeth often have discoloration, hypersensitivity, susceptibility to rapid wear, and loss of vertical dimension of occlusion (OLD) (Möhn et al., 2021; Chen et al., 2024). In addition to the functional implications, such as chewing difficulties and gingivitis, aesthetic impairments can lead to psychosocial distress, including low self-esteem and social isolation, especially in children and adolescents (Novelli et al., 2021; Lundgren; Dahllöf, 2024).

The treatment of UA is complex and must be tailored to the patient's age, severity of the defect, and functional and aesthetic needs. Options range from conservative approaches, such as direct resin composite restorations, to extensive prosthetic rehabilitations with ceramic or metalloceramic crowns (Roma et al., 2021; Chen et al., 2024). In young patients, management is particularly challenging due to mixed dentition, continuous facial growth, and often poor collaboration (Möhn et al., 2021; Herrera-Rojas; Perona-Miguel de Priego, 2023).

This study aims to review the current strategies for the restorative and functional management of UA, discussing the indications, advantages, and limitations of different treatment modalities, from minimally invasive techniques to complete oral rehabilitations.

2 METHODOLOGY

This narrative literature review was conducted with the aim of synthesizing the current evidence on the restorative and functional treatment of amelogenesis imperfecta. The search for articles was performed in the PubMed database, using the descriptors "Amelogenesis Imperfecta" and "Treatment", combined by the Boolean operators AND and OR, in accordance with the terms of the Medical Subject Headings (MeSH). Studies published preferably in the last five years, available in full in English or Portuguese, that addressed restorative techniques, sensitivity management, occlusal rehabilitation, and impact on quality of life were selected. Editorials, letters to the editor, and studies that did not specifically focus on the treatment of UA were excluded. The selection of articles followed a two-stage process: initial screening by titles and abstracts, followed by complete reading to confirm eligibility. The extracted data were organized thematically to compose the discussion.

This study consists of a narrative literature review, elaborated with the objective of synthesizing and discussing the main available evidence on the restorative and functional treatment of amelogenesis imperfecta (UA). The review was conducted following the principles of methodological rigor applicable to narrative reviews, including prior definition of the guiding question, eligibility criteria, and structured search strategy.

The prospection of studies was carried out exclusively in the PubMed database, selected because it concentrates publications of greater relevance in the dental area. The descriptors "Amelogenesis Imperfecta" and "Treatment" were used, combined by the Boolean operators AND and OR, according to the terminologies established by the Medical Subject Headings (MeSH). The strategy was applied without automatic filters, allowing for a broader initial screening, later refined by the inclusion and exclusion criteria.

Articles published preferably in the last five years, available in full in English or Portuguese, that addressed restorative interventions, management of tooth sensitivity, proposals for functional rehabilitation, and the impact of treatment on patients' quality of life were included. Editorials, letters to the editor, studies without a therapeutic focus, non-systematic reviews with little methodological description, and studies that dealt with UA only from genetic or epidemiological aspects, with no direct relationship with treatment, were excluded.

The selection of studies was conducted in two stages. In the first, we were screened by titles and abstracts in order to identify potentially relevant texts. In the second

stage, the pre-selected articles were read in full to confirm eligibility based on the previously defined criteria. The extracted data were organized in a thematic way, covering types of restorative interventions, adhesive techniques, strategies for protecting the dental substrate, functional approaches and aesthetic considerations.

As this is a narrative review, statistical methods of meta-analysis were not applied. However, we sought to ensure interpretative consistency through critical comparison between the included studies, highlighting convergences, limitations, and gaps still present in the literature.

3 RESULTS AND DISCUSSION

3.1 APPROACHES IN DECIDUOUS AND MIXED DENTITION

Early management of UA is crucial to preserve tooth structure, reduce sensitivity, and maintain OLD. In children, treatment is often temporary and aims to restore function and aesthetics while waiting for complete maturation of occlusion and completion of facial growth. The use of stainless steel crowns on young deciduous and permanent molars is a common strategy to protect teeth with severe enamel defects and prevent excessive wear (Möhn et al., 2021; Herrera-Rojas; Perona-Miguel de Priego, 2023). For anterior teeth, direct restorations with composite resin or compomer are often indicated, although they may have limited longevity due to compromised adhesion to defective enamel (Möhn et al., 2021). However, composite resin restorations, although they have lower performance when compared to ceramics (Gresnigt et al., 2019), also prove to be advantageous in many cases. Recent in vitro studies show good results with this material, especially because it allows more conservative approaches and demonstrates good fracture resistance (Gresnigt et al., 2019).

3.2 TREATMENT IN ADOLESCENTS AND YOUNG ADULTS

In adolescent patients, where aesthetics becomes a higher priority, direct and indirect restorative techniques are employed. To choose the technique to be used, the main criteria analyzed are: patient's age, extent of enamel lesions and aesthetics. The use of prefabricated composite resin veneers has been described as an effective "semi-direct" alternative, offering satisfactory esthetics with preservation of tooth structure and shorter clinical time compared to traditional ceramic veneers (Novelli et al., 2021). However, composite resin restorations may have higher failure rates in patients with

hypomineralized or hypomatured UA compared to the hypoplastic form (Novelli et al., 2021; Lundgren; Dahllöf, 2024).

For more severe cases or when aesthetics and function are severely compromised, rehabilitation with ceramic (e.g., lithium disilicate) or metal-ceramic crowns has shown high success rates and longevity, even in young patients (Chen et al., 2024; Roma et al., 2021). Studies indicate that single ceramic crowns should be considered the first choice for definitive restoration, due to their durability and ability to reduce tooth sensitivity (Lundgren; Dahllöf, 2024).

3.3 COMPLETE ORAL REHABILITATION AND RESTORATION OF OLD

Patients with UA often experience significant loss of OLD due to widespread tooth wear. Complete oral rehabilitation is often necessary to re-establish lower facial height, masticatory function, and aesthetics. OLD augmentation should be carefully planned, often using occlusal splints or temporary restorations to assess the patient's adaptation before the definitive prostheses are made (Chen et al., 2024; Roma et al., 2021). The use of lithium disilicate crowns has been reported to be a predictable and aesthetic option for total rehabilitation, allowing for successful OLD increases of 2 to 4 mm (Chen et al., 2024).

3.4 ENDODONTIC AND MULTIDISCIPLINARY CONSIDERATIONS

The treatment of UA often requires a multidisciplinary approach. In cases of pulp calcification or necrosis, endodontic treatment may be necessary before prosthetic rehabilitation, although it can be challenging due to the complex anatomy of the canals (Roma et al., 2021). Collaboration between pediatric dentists, orthodontists, prosthodontists, and endodontists is critical for long-term success (Novelli et al., 2021; Herrera-Rojas; Perona-Miguel de Priego, 2023). In addition, genetic counseling is recommended, given the hereditary nature of the condition (Lundgren; Dahllöf, 2024).

4 CONCLUSION

It is concluded that the treatment of amelogenesis imperfecta requires a structured, progressive, multidisciplinary and individualized approach, due to the great variability of clinical manifestations. Early management is essential to minimize hypersensitivity, protect teeth from excessive wear, and maintain occlusal stability. In adolescent and young adult patients, direct and indirect restorative techniques, when appropriately

indicated, are an option to provide functional stability and significant aesthetic improvement. In more severe cases, complete oral rehabilitation, with controlled reestablishment of the vertical dimension of occlusion, is a safe and effective strategy, especially with the use of high-strength ceramic crowns. The integrated participation of different dental specialties, associated with continuous patient monitoring, is essential for long-lasting results. Thus, the rehabilitation of individuals with UA should prioritize the preservation of tooth structure, the recovery of masticatory function, and psychological and social well-being, promoting broad, stable, and long-term rehabilitation. In addition, future studies are needed to improve restorative protocols, evaluate new adhesive and ceramic technologies, and standardize conducts for the different phenotypes of the disease.

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