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Conservative Esthetic Management of Amelogenesis Imperfecta – Direct Composite Veneer: A 1-Year Follow-Up Case Report

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ABSTRACT
Amelogenesis imperfecta (AI) represents a group of genetic disorders affecting enamel development, often leading to severe esthetic and functional dental challenges in affected individuals. This case report highlights the clinical management of a 14-year-old female patient diagnosed with hypoplastic AI using direct composite resin restorations. A comprehensive approach included prophylactic cleaning, diagnostic wax-up, and shade selection, followed by a multi-layered restorative protocol using nanoparticulate composite materials. The restorative procedures emphasized enamel preservation, esthetic improvement, and functional rehabilitation. After one-year follow-up, the restorations showed excellent retention, marginal integrity, and patient satisfaction, which only required some polishing at 1-year follow-up. This case underscores the feasibility and long-term success of direct composite resin in treating young AI patients with cost-effective and minimally invasive methods.

Keywords: Amelogenesis imperfecta, direct composite resin veneer, esthetic rehabilitation, enamel defects, nanoparticle composite

I. INTRODUCTION

Amelogenesis imperfecta (AI) is defined as “a group of inherited defects in the formation of enamel structure and clinical appearance. It affects all or nearly all teeth, occurring in the absence of systemic disease”. AI encompasses a group of rare genetic conditions that interfere with the normal development and quality of dental enamel. The condition may follow various inheritance patterns, including X-linked, autosomal dominant, autosomal recessive, or, in some cases, sporadic occurrence. Clinically, AI manifests with poor oral hygiene, increased plaque accumulation, hypersensitivity, difficulty in mastication, and compromised esthetics, negativelyimpacting psychosocial well-being and quality of life [1,2].

AI is phenotypically classified into four main types: Type I – hypoplastic involves deficient enamel matrix secretion; Type II – hypomatuation relates to defects in enamel crystal growth;Type III – hypocalcified affects mineralization, producing friable enamel; and Type IV combines hypoplastic and hypomaturation enamel defects with taurodontism [1,2].Treatmentplanning should balance esthetic, functional, and financial considerations. Restorative options depend on the quantity and quality of residual enamel. Direct composite resin restorations,when feasible, offer advantages such as color masking, morphology correction, enamelconservation, and cost-effectiveness [3]. Nanoparticulate composite resins allow betterpolishability and wear resistance, making them suitable for extensive anterior rehabilitations [4].
This report presents a 1-year clinical follow-up of a young AI patient rehabilitated with direct composite resin, emphasizing conservative and esthetically driven management.

II. CASE REPORT

A 14-year-old female reported to the Department of Conservative Dentistry and Endodontics at Government Dental College, Thiruvananthapuram, with the chief complaints of yellowish discoloration of tooth and mild sensitivity. The patient described a history of discomfort and sensitivity particularly in response to cold beverages. Beyond the physical symptoms, the patient expressed considerable emotional and psychosocial distress due to the condition. She reported a marked reluctance to engage in social activities and conveyed a sense of low self-esteem directly associated with the appearance of her teeth. Her primary concern was to "get her teeth fixed" in order to alleviate both her discomfort and the associated psychological burden.

The family history was significant for similar enamel defects in her father and brother, albeit to a lesser extent, suggesting a likely autosomal dominant mode of inheritance.Although genetic testing would provide a definitive

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diagnosis, it was not performed due to financial constraints. Therefore, the diagnosis of hypoplastic amelogenesis imperfecta was made based on the clinical presentation, radiographic findings, and positive family history.

The patient's dental history revealed multiple extractions of deciduous teeth due to early breakdown and poor structural integrity. This likely contributed to the present malocclusion, including crowding due to improper eruption patterns, further supporting the diagnosis of a genetic condition affecting both the primary and permanent dentitions. [Fig 2 d,e]

On clinical examinationher teeth exhibited a yellowish hue with generalized enamel pitting and surface fissuring, particularly affecting the anterior teeth, affecting the maxillary arch more prominently than the mandibular, accompanied by mild sensitivity to cold stimuli. The enamel appeared poorly mineralized and irregular, Additionally, signs of gingival inflammation were observed [Fig 1(a)]

Intra oral soft tissue examination showed normalcoral pink gingiva, however, with mild erythema observed in marginal gingiva from 13 to 23. Loss of normal stippling; surface appeared smooth and shiny, suggestive of chronic inflammation, 13 to 23. Loss of normal scalloped architecture; gingival margins appear irregular irt 11 and 21.Bleeding on probing (BOP), present in the anterior tooth region from 13 to 23, indicating gingival inflammation. [Fig 1 (a)]

Radiographic evaluation demonstrated a normal contrast between enamel and dentin, indicating that the enamel was well mineralized. However, there was a generalized reduction in enamel thickness, consistent with the hypoplastic type of AI.

Based on the clinical appearance of enamel defect, radiographic evaluation and family history, a provisional diagnosis of the hypoplastic type of Amelogenesis Imperfecta (AI) was established. [Fig 1 & 2]

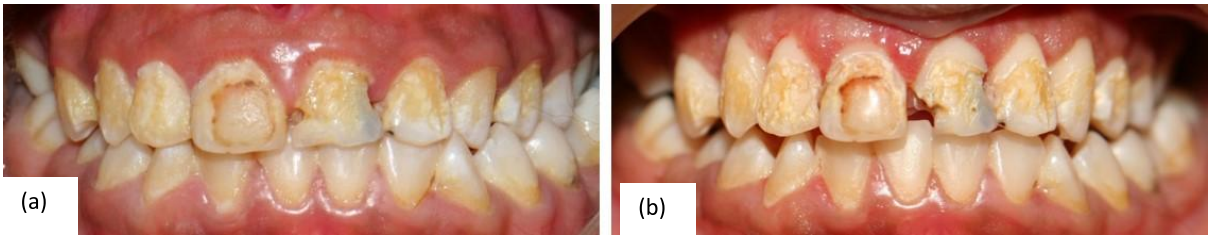

Fig1: (a) Initial clinical view showing hypomineralized enamel;(b) Following gingivectomy and full mouth prophylaxis

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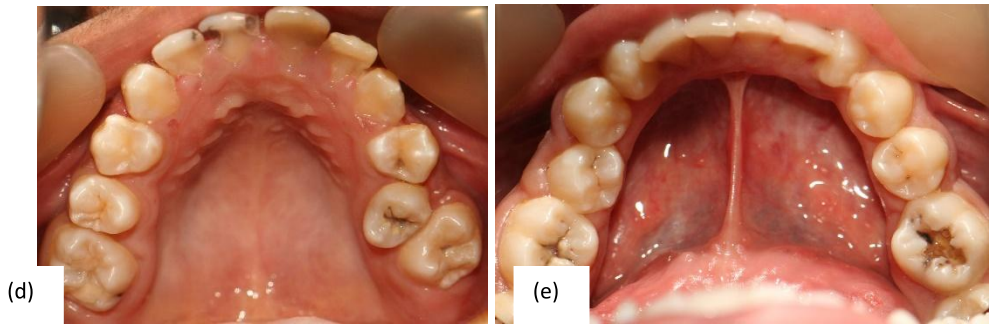

Fig 2:(a) Left and right lateral view; (b) Full smile; (c) Full face frontal view; (d) Maxillary occlusal view; (e) Mandibular occlusal view

Initial treatment involved a full-mouth prophylaxis along with reinforcement of oral hygiene practices. Gingivectomy was performed at the Department of Periodontology to improve the gingival architecture and enhance esthetic outcomes. The procedure was carried out on the labial gingiva from tooth 13 to 23, with an external bevel incision made in a scalloped fashion, carefully following the natural contour of the gingival margin. [Fig 1 (b)] The goal was to remove excess gingival tissue and recontour the gingival architecture while preserving the interdental papilla. This approach was intended to create a harmonious and esthetically pleasing gingival outline**.**Following adequate healing, a diagnostic wax-up was carried out to guide the restorative planning.

The treatment plan included precise shade selection for dentin, enamel, and incisal edge characterization. Previously placed composite restorations were carefully removed to ensureproper bonding and anatomical reconstruction.A rubber dam was used for isolation, with floss tie aiding gingival retraction. Enamel preparation involved minimal intervention using rotary instruments.Selective enamel etching was performed using Eco-Etch (IvoclarVivadent, Schaan, Liechtenstein), a 37% phosphoric acid gel. The etchant was applied to the enamel surfaces for 30 seconds and to exposed dentin (where necessary) for 15 seconds, followed by thorough rinsing with air–water spray and gentle air-drying to achieve a frosted enamel surface while preserving moist dentin. A universal adhesive, Single Bond Universal (3M ESPE, St. Paul, MN, USA), was applied to the etched tooth surfaces using a microbrush and actively rubbed for 20 seconds. The adhesive was gently air-thinned and light-cured for 10 seconds using a Woodpecker LED D Curing Light Unit (Guilin Woodpecker Medical Instrument Co.,Ltd., Guilin, Guangxi, China).

A stratified composite layering technique was employed using Palfique LX5 (Tokuyama Dental Corporation, Tokyo, Japan), a nanohybrid light-cured composite resin known for its high polishability and excellent optical properties. The palatal shell was first built using Translucent shade using a putty index to guide the preparation [Fig 3(a)]. Anatomic layering was achieved as follows:

- Incisal edge: Translucent shade to replicate natural incisal translucency
- Incisal third: A1 Enamel shade
- Proximal regions: Translucent shade to simulate the natural enamel's translucency in these areas.
- Middle third: A2 Enamel shade
- Cervical third: A2 Enamel shade
- Dentin replacement (tooth 21): OA1 dentin shade

Each increment (≤2 mm) was individually light-cured for 30 seconds using the same curing unit. Layering was performed tooth by tooth to ensure proper morphology and contact point integrity. After the final composite layer was shaped and adapted, a glycerin-based gel (Liquid Strip, IvoclarVivadent, Schaan, Liechtenstein) was applied over the restoration surface prior to final light curing to eliminate the oxygen inhibition layer and ensure complete polymerization of the outermost layer. [Fig 3(b)]

Each anterior tooth was restored following the same protocol. Marginal adaptation was verified with a mouth mirror. After dam removal, excess resin was trimmed. Initial finishing was done using Super-Snap Polystrips and abrasive discs (Shofu Inc., Kyoto, Japan). To achieve a lifelike restoration, particular attention was paid to recreating the surface morphology and

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macro-anatomy of natural teeth. After completing the stratified layering of the composite resin, facial contours and developmental lobes were refined using fine-grit flame-shaped and round-end diamond burs. Vertical and horizontal depressions, simulating natural perikymata and mamelon structures, were carefully carved using a medium-grit flame-shaped. Surface texture was subtly introduced to reduce excessive gloss and achieve a more natural appearance. [Fig 3 (a – f)]

Final polishing was done after 24 hours[Fig 4] using a low-pressure technique with the EVE Twist system, which preserved micro-morphology while providing a high-gloss finish.The patient was recalled at 1 month, 6 months, and 1 year postoperatively. At the 1-year follow-up [Fig 5 & 6], restorations exhibited excellent marginal integrity and no signs of chipping or debonding. Minor superficial staining was observed and corrected via chairside re-polishing with EVE Twist system.

Fig 3: (a) Putty index for palatal shelf build up; (b) Final light curing performed under a glycerin-based liquid strip to eliminate the oxygen-inhibited layer; (c) Pencil markings used to outline individual lobes and transitional lines; (d) Refinement of surface morphology and macro-anatomy using flame-shaped and round-end diamond burs; (e Initial polishing completed using abrasive discs and polyester strips; (f) Immediate postoperative view

Fig 4: Final polishing after 24 hrs

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Fig 5: Post-operative full mouth retracted view 1-year follow-up

Fig 6: (a) Post-operative Left and right lateral view 1-year follow-up; (b) Post-operativefull smile; (c) Post-operative full face frontal view

III. DISCUSSION:

Amelogenesis Imperfecta poses significant challenges in both function and esthetics due to thin, pitted, and often discolored enameland it also causes psychosocial burdens, particularly in adolescents.Patients often experience embarrassment and reduced self-confidence due to unaesthetic teeth. Restorative management aims to protect tooth structure, enhance appearance, and improve the patient's quality of life. Among the conservative options, direct composite veneers offer a minimally invasive and cost-effective solution, particularly in younger patients or when full-coverage crowns are not yet indicated [5,9]. Early intervention not only addresses these functional issues but also enhances psychological well-being and social participation.

This case utilized direct composite veneers as a conservative and cost-effective solution. Given the presence of sufficient enamel, adhesive bonding using Single Bond Universal was reliable. The choice of Palfique LX5, a nanohybrid composite, allowed effective anatomical stratification. Its high filler load and nano-sized particles (~0.2 µm) contribute to mechanical durability, polishability, and optical blending [6,12].

The layering technique with multiple opacities allowed mimicry of natural tooth zones; incisal, body, and cervical. This method has been supported by Vanini and Paravina as essential for esthetic anterior restorations [13,14]. Incremental placement also minimizedpolymerization stress.

In the final step of the restoration, a layer of glycerin-based liquid strip (IvoclarVivadent, Schaan, Liechtenstein) was applied over the composite surface prior to light curing. This technique was employed to eliminate the oxygen inhibition layer (OIL), which forms due to the interaction between atmospheric oxygen and free

radicals on the surface of the resin composite. The presence of OIL can compromise surface hardness, reduce the degree of conversion, and increase the susceptibility of the restoration to marginal breakdown and extrinsic discoloration over time. By curing under an oxygen-free environment, the polymerization of the outermost resin layer is optimized, resulting in improved surface integrity, wear resistance, and enhanced stain resistance. Yoshida et al. demonstrated that oxygen inhibition significantly affects the surface properties of resin composites, and that using an oxygen barrier such as glycerin can effectively mitigate this effect, thereby improving both the mechanical and esthetic performance of the final restoration[15]. Polishing is critical for longevity; EVE Twist Polishers provided a smooth, plaque-resistant surface, reducing biofilm retention. Studies by Janus and Bashetty confirm the importance of surface roughness control in long-term success [8,17].

Bonding Considerations in Hypoplastic AI

Bonding to enamel affected by AI, especially the hypoplastic type, is more reliable than in hypocalcified or hypomaturation types due to the enamel being well mineralized, though thin and irregular. However, enamel pits and grooves may reduce effective bonding area and require careful surface preparation.

Etching Protocol

Studies suggest that in hypoplastic AI, the application of 37% phosphoric acid for 30–60 seconds can enhance surface roughness and improve micromechanical retention for bonding agents. This longer etching time compensates for irregular or limited enamel prisms. [7]

Studies show that direct composite veneers offer satisfactory esthetics and function in patients with hypoplastic AI and can serve as a long-term or transitional option depending on age and severity. [8]

Direct composite veneers serve as a transitional therapy until skeletal maturity is reached for full-coverage restorations like ceramic crowns or veneers. The biomimetic nature of this approach preserves natural structure and avoids premature prosthodontic intervention [10,18].

In long-term perspectives, composite restorations show success rates exceeding 85% at 5 years when proper protocols are followed [19,20]. Thus, for adolescent AI patients, this approach balances biology, esthetics, and economy efficiently.

IV. CONCLUSION

Direct composite resin restorations offer a conservative, cost-effective, and esthetically pleasing solution for managing amelogenesis imperfecta in adolescents. With appropriate technique, material selection, and patient cooperation, long-term results are achievable, making this approach highly suitable for young patients until more definitive prosthetic options become viable.

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