

## Case Report

# Treating Amelogenesis Imperfecta with Ultra Thin Monolithic Zirconia Veneers: A Case Report

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### ARTICLE INFO



Keywords:

Amelogenesis

imrefecta,Zirconia,Veneer

### ABSTRACT

Amelogenesis imperfecta is a rare hereditary disorder which may also be associated with morphologic and biochemical changes in the body such as taurodontism, multiple impacted teeth, congenitally missing teeth and malocclusions (open bite or class III). In this case report a 22 year female patient with amelogenesis imperfecta has been treated with ultra thin veneers made of monolithic zirconia with ivoclar classic layer. Self adhesive resin cement Relyx u200Veneer of A2 medium value (3M) was used for cementation of veneers satisfying both aesthetic and functional demands.

### INTRODUCTION

Amelogenesis imperfect (AI) is a rare hereditary disorder which affects the formation and clinical appearance of the teeth which include hypoplastic, hypomineralised and hypo maturation involving different stages of enamel formation in both primary and permanent.<sup>1</sup> Differential diagnosis must be made with enamel developmental defects caused by environmental factors (fluoride, tetracycline) or traumatic etiologies as they will only affect defined teeth and rarely both dentitions. Mutations have been reported in different genes. Some of them encode for enamel proteins, either structural (amelogenin, enamelin ameloblastin, c4orf26) or

enzymatic (kallikrein 4, MMP20); some others encode for transcription factors (MSX2, DLX3), cellular proteins (WDR72, FAM83H, COL17A1), cellular receptor (ITGB6) and calcium carrier (SLC24A4).<sup>2</sup>

1. Clinical appearance would be discolored and sensitive. The management of AI-affected teeth include micro abrasion, laminate veneers, composite resin restorations, composite or ceramic onlays, stainless steel crowns, and metal- ceramic/all-ceramic crowns. With technological improvement and the evolution of dental restorative materials, it is currently possible to develop/produce ultra-thin veneers with thickness of 0.1–0.3mm, adhesively cemented on the tooth surface with minimal

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or no preparation, to modify color, shape and/or positioning of the teeth. Zirconia was the best suited to mask the discoloured teeth and also to maintain the internal strength and vitality of the teeth. Zirconia (ZrO<sub>2</sub>) is a silica-free, acid-resistant, polycrystalline ceramic that does not contain amorphous silica (SiO<sub>2</sub>).<sup>4</sup> Depending on the type of treatment of the zirconia surface, it is possible to significantly improve their adherence to resin cement.

### CASE PRESENTATION

A 22-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Sri Sai college of dental surgery, Vikarabad with a chief complaint of yellowish discoloration of teeth and difficulty in chewing. Intra oral examination revealed hypoplastic teeth areas showing hypomineralisation.

Clinical examination revealed yellowish discoloration, generalized attrition, gingival bleeding, mottling of enamel, midline diastema, RCT treated 26, delayed response in 17,36,43,45,46 (electric pulp testing). Vertical dimension at occlusion and rest were normal, with the evaluation of interocclusal distance clinically and phonetically. Radiographic examination revealed decreased radiodensity of enamel, suggestive of Amelogenesis imperfecta.

History taking outlined that the patient comes from a rural area with a small population where marriage between cousins is very common. Patient's family history was remarkable with pedigree presenting consanguineous marriage between parents. Her younger sister also presented with the same condition. Veneer treatment was considered for the patient. A direct composite mock-up was done before anesthesia. The teeth were spot-etched and composite was added to

check tooth proportions, esthetics, and act as a color preview.

Treatment plan was discussed taking several objectives into consideration.

1. Functional restoration
2. Aesthetic restoration
3. Minimally invasive restoration
4. Lasting restoration

### PROCEDURE

Anesthesia was achieved using 2% lignocaine hydrochloride. 0.3 mm-0.5 mm depth orientation grooves were made on the facial and incisal surfaces of the tooth with wheel diamond depth cutter respectively on 11,12,13,21,22,23 and 31,32,33,41,42,43. The depth grooves were connected with each other and tooth structure in between was removed with a round end tapered diamond bur. A medium grit diamond bur with rounded edge (Mani Dia bur TR-12) was used on the buccal surface of the teeth to remove a uniform thickness of 0.3 mm. Incisal edge was reduced by 0.5 mm and preparation was extended palatally to enhance esthetics. All angles were rounded and the cervical finish line in tilted chamfer was continuous, defined and clear. Retraction cord was placed for gingival retraction (Medi-Pak 000 knitted non-impregnated, India) and final impressions were made with elastomeric impression material. Preparation for zirconia veneers is consistent with preparations for traditional porcelain with 3-plane reduction with no sharp internal corners. The veneers were designed, milled, cut back, and layering porcelain was applied monolithic zirconia with ivoclar classic layer. Temporization of tooth after reduction was done with composite veneering.

Self adhesive resin cement Relyx u200 Veneer of A2 medium value (3M) was used for cementation of

veneers. Teflon tapes and cotton rolls are used to isolate teeth during cementation, which were placed in their respective teeth. The excess resin cement was removed with a probe and floss, followed by light-curing for 40 seconds for each veneer.

## DISCUSSION

AI is a developmental condition of the dental enamel (characterized by hypoplasia and/or hypomineralization) that shows either autosomal dominant, autosomal recessive, sex-linked inheritance.

AI can have different inheritance patterns depending on the gene that is altered. Most cases are caused by mutations in ENAM gene and are inherited as autosomal dominant. AI is also inherited in an autosomal recessive pattern; this form of the disorder can result from mutations in the ENAM or MMP20 gene. Mutations in AMELX gene is inherited in an X linked pattern and contribute to 5% of AI cases. AI is due to the malfunction of the proteins in the enamel: ameloblastin, enamelin, tuftelin. A condition is considered X-linked if the mutated gene that causes the disorder is located on the X chromosome, one of the two sex chromosomes.

Different treatment modalities are considered depending on dentition, age, socio economic status of patient. These include composite veneering, dentin bonded crowns, strip crowns, laminate veneers (porcelain, lithium disilicate, zirconia) full coverage crowns (gold, ceramic, zirconia). This type of zirconia provides adequate aesthetic to mask the discoloration of the teeth and mechanical properties for all-ceramic restorations for both anterior teeth.

Alghazzawi et al <sup>5</sup> evaluated the influence of cement color on the final color of ceramic veneers and observed that conventional zirconia was neither influenced by the color of the resin cement nor by the color of the

substrate, even at a minimum thickness. In order to optimize the adhesion between zirconia and cement, various surface treatments have been proposed: sandblasting with aluminum oxide, tribochemical silica coating followed by silanization, nanostructured alumina coating, resin cement containing 10-methacryloxydecyl dihydrogen phosphate monomer (MDP), universal primers also containing methacrylate monomers, plasma processing, silica infiltration by sol-gel method, feldspathic glass infiltration, selective infiltration-etching technique, glaze-on technique, and heating silanes, among others. Therefore, the treatment of zirconia surfaces has been the subject of much scientific research, predictability and good clinical performance in the long term.<sup>1</sup> With technological improvement and the evolution of dental restorative materials, it is currently possible to develop/produce ultra-thin veneers with thicknesses of 0.1–0.3mm, adhesively cemented on the tooth surface with minimal or no preparation, to modify color, shape and/or positioning of the teeth.<sup>6</sup>

Several types of zirconia have been most often used in clinical dentistry such as: traditional tetragonal (opaque) zirconia, with a strength range from 900 to 1200 MPa; high-translucent (HT) zirconia (900 to 1200 MPa) and cubic ultra-translucent (UT) zirconia (500 to 800 MPa).<sup>7</sup>

*In vitro* studies on veneers have reported a higher resistance to fracture of zirconia compared to lithium disilicate and feldspathic veneers, which can be regarded as a great advantage of this material, as the proof and cementation stages of ultra-thin veneers become much less critical compared to conventional glass-ceramics.<sup>8</sup>



**Fig 1:** Pre operative



**Fig 2:** Pre operative -OPG



**Fig 3:** Intra oral image showing AI



**Fig 4:** Post-operative image showing ultra thin zirconia crowns

## CONCLUSION

With advancing technology and materials, minimal amount of reduction of enamel with ultra thin veneers would be beneficial to patient and can be considered as the most desirable treatment option for Amelogenesis imperfecta.

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