

Complete Mouth Rehabilitation of a Young Adult with Hypoplastic Amelogenesis Imperfecta: A Case Report

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Abstract

Amelogenesis imperfecta (AI) encompasses a diverse group of hereditary conditions that cause developmental alterations in the structure of the enamel. Its clinical manifestations commonly include unsatisfactory esthetics, dental sensitivity, and attrition and loss of occlusal vertical dimension (OVD) due to the rapid wearing of dentition. Treatment of AI is important not only because of esthetic and functional concerns, but also to develop a positive psychological attitude in the patient, and a multidisciplinary approach is often necessary. Treatment planning is governed by factors such as the age and socioeconomic status of the patient, the type and severity of the disorder, and the intraoral condition at the time of presentation. This clinical report describes the treatment for a young female patient with hypoplastic AI using ceramometal restorations.

Key Words: Full mouth rehabilitation, Amelogenesis imperfecta, Prosthodontics

Introduction

Amelogenesis imperfecta (AI) encompasses a diverse group of hereditary conditions that cause developmental alterations in the structure of the enamel, which affects the quality and quantity of dental enamel in the absence of a systemic disorder. AI has an estimated prevalence of approximately 1/14,000 in the United States and, different inheritance patterns, including autosomal dominant, autosomal recessive, and X-linked, have been suggested in the literature [1]. AI has been broadly classified into following subgroups on the clinical and radiographic basis, which may be correlated with aberrations in the process of enamel formation [2]: (a) Hypoplastic AI results from defects in the secretory process of ameloblasts, is characterized by presence of pitted enamel which is reduced in quantity. The thin enamel is relatively well-mineralized, has a hard texture and is tinged with a yellow-brown color. (b) Hypocalcified AI results from an inability of crystallites to properly nucleate causing abnormal crystallite growth and decreased mineral content in enamel. The enamel is formed in relatively normal amounts but is poorly mineralized, is generally abraded and easily detachable from the underlying dentin. (c) Hypomature AI is caused by abnormal processing of the matrix proteins during maturation, and results from either abnormal cleavage of enamel matrix proteins or abnormal proteinase activity. The enamel is soft, opaque, and mottled white, yellow, or brown in appearance.

The common clinical problems present in AI patients include unsatisfactory esthetics, dental sensitivity, and attrition and loss of occlusal vertical dimension (OVD) due to the rapid wearing of dentition. It is often associated with anterior open bite, delayed eruption and multiple impacted teeth. Additionally, non-enamel dental anomalies such as taurodontism, congenitally missing teeth, failure of eruption, root or crown resorption, root malformations and hypercementosis are known to be associated with AI [3]. Treatment of AI is important not only because of esthetic and functional concerns, but also to develop a positive psychological attitude in the patient [4]. Treatment planning is governed by factors such as the age and socioeconomic status of the patient, the type and severity of the disorder, and the intraoral condition at the time of presentation [5]. This clinical

report describes the treatment for a young female patient with hypoplastic amelogenesis imperfecta using ceramometal restorations.

Case Report

Case history and intraoral examination

An 18-year-old female previously diagnosed with hypoplastic AI presented for treatment. She complained about the unaesthetic appearance of her anterior teeth, had sensitivity to hot and cold and reduced chewing ability (*Figures 1,2*). A detailed medical, dental, and social history was obtained to rule out any contraindications to dental therapy.

The family medical history revealed that the patient's sister was affected by hypoplastic AI. The patient did not show facial asymmetry or incompetent lips, and there was no muscle tenderness, or signs and symptoms of temporomandibular joint disorders. Intraoral examination revealed that the enamel was yellow-brown, with hard texture and exhibited no signs of detachment by an explorer. The incisal edges were thin and attrided, the cuspal structures were attrided, and tooth surfaces were found to be dull and rough. The patient had canine guided occlusion but disclusion of incisors occurred upon excursion movements by posterior segments. There was no interference on balancing sides; however, the most posterior parts of the maxillary and mandibular arches made contact during protrusive jaw movement. The patient had a class I molar relationship, interocclusal distance measured at the premolar region during physiological rest was 2 mm, and centric relation position was coincident with centric occlusion. Mandibular right lateral incisor was rotated, while maxillary right first premolar was placed more buccally. Periodontal evaluation revealed healthy periodontium, absence of any inflammation of gingiva, no deposits, no bleeding on probing, and coral pink attached gingiva with normal stippling.



Figure 1. Preoperative frontal view in centric occlusion.



Figure 2. Preoperative extraoral view of smile displaying reverse smile line due to attrition of incisors.

Assessment of occlusal vertical dimension (OVD) and interocclusal rest space (IORS)

Evaluation of existing occlusal vertical dimension and IORS provides important initial reference in comprehensive treatment planning. IORS, i.e. the difference in vertical dimension, when the mandible is at rest and in occlusion, was found to be 2 mm in present case. An IORS of 2-3 mm has been suggested as the physiological space, which indicated that tooth eruption and alveolar bone growth compensated for the loss of OVD by attrition. The rationale behind measuring the IORS was to evaluate the need and feasibility of increasing the OVD. Phonetic evaluation was carried out by asking the patient to pronounce labiodentals fricatives such as f and v, and observation of Silverman's closest speaking space during production of sibilant sounds. Results of judging facial appearance by dividing face into three equal parts revealed that there was a slight decrease in nose to chin distance (LFH) resulting from attrition of teeth. In essence, patient had an IORS of 2 mm, while space requirement for PFM crowns to develop esthetically pleasing restorations and satisfactory occlusion could be obtained by incisal and occlusal reductions during tooth preparations.

Diagnostic wax up, treatment planning, and rationale

Maxillary and mandibular complete arch primary impressions were made using a heavy and light body vinylpolysiloxane impression material (Imprint, 3M ESPE, Seefeld, Germany). The impressions were poured twice to obtain two sets of diagnostic casts with a type III dental stone (Fuji Rock, GC Dental- Corp., Tokyo, Japan). One cast set was used for the diagnostic wax-up, and the other was saved for patient records. The casts were mounted on a semi-adjustable articulator (Hanau Wide-View, Whip Mix Corporation, Fort Collins, CO) using a facebow transfer and the centric relation record. The articulator was programmed based on protrusive record. Occlusal analysis was performed, and diagnostic wax up was developed (Figure 3) [6]. The anterior guidance and posterior disclusion on excursive movement were established in the diagnostic wax up [7]. Various treatment options, such as vital tooth bleaching, direct composite veneers, ceramic laminates, posterior occlusal table tops (Ivoclar Vivadent), pressable ceramic crowns, zirconia crowns, and ceramometal crowns were proposed. After knowing advantages and limitations of different treatment modalities, patient consented for complete mouth rehabilitation using ceramometal crowns.



Figure 3. Diagnostic waxup.

The restorative protocol - tooth preparation, temporization, and final restorations

Maxillary and mandibular anterior and posterior teeth were prepared for porcelain fused to metal (PFM) restorations using high speed rotary instrumentation under water spray irrigation following biological, mechanical and esthetic principles of tooth preparation (Figure 4) [8]. Sloped shoulder and shoulder finish lines were given on facial aspects of anterior and posterior teeth respectively, while chamfer margins were placed on palatal and lingual aspects of all tooth preparations. Diagnostic wax up was acrylized using tooth colored heat polymerized poly (methyl methacrylate) (PMMA) resin (Acrylin, DPI, Mumbai, India) following standard laboratory procedure, to form provisional restorations. These restorations were lined with autopolymerizing PMMA resin (Alike Temporary C&B Resin; GC America), and cemented with temporary luting cement (Freegenol, GC Corp., Tokyo, Japan) (Figure 5).



Figure 4. Tooth preparation to receive ceramometal restorations.



Figure 5. Provisional restorations in place.

Centric occlusion, even protrusive contacts, canine guidance and disclusion of posterior teeth during eccentric movements of mandible were verified in the provisionals before discharging patient. The patient wore the provisional restorations for 4 months without complications. During the evaluation period, the patient's anterior and posterior speaking space and function were assessed. The muscles of mastication and the temporomandibular joint were evaluated for clinical signs of discomfort, and it was observed that the patient was asymptomatic and comfortable during this period [9]. Patient had history of pain related to teeth # 37, 43, 46 and hence their endodontic treatment was carried out using standard techniques. To record and preserve the anterior guidance of the provisional restorations, irreversible hydrocolloid impressions were obtained and poured in dental stone. Maxillary and mandibular casts were mounted to the semiadjustable articulator using face bow transfer and centric record. A custom incisal guide table was fabricated from acrylic resin (Pattern Resin LS; GC America) [7]. Final tooth modification and gingival retraction were carried out in the maxillary and mandibular arches, and definitive impressions were recorded using polyvinyl siloxane impression material (Affinis; Coltène/Whaledent Inc, Cuyahoga Falls, Ohio).



Figure 6. Final restorations- centric occlusion.

Definitive casts were obtained using die stone. Bite registration was taken using provisional crowns and occlusal registration material (StoneBite; Dreve Dentamid GmbH, Unna, Germany) in sections. Casts were transferred to the semiadjustable articulator using facebow and bite registrations. Individual ceramometal crowns (SuperCast, Talladium Inc., Valencia, USA; IPS Classic, Ivoclar Vivadent AG, Schaan, Liechtenstein) were made using customized anterior guide table fabricated previously. The prostheses were designed using mutually protected occlusion in which the anterior teeth protected the posterior teeth from excursive force and wear, and posterior teeth supported the bite force. The interocclusal space was ultimately evenly divided between the maxillary and mandibular arches at the time of definitive restorations, and cusp –fossa relationship was developed in ceramic crowns. During bisque trial, centric occlusion, anterior guidance, and posterior disclusion were verified in the definitive restorations. Long centric occlusion was developed in the maxillary anterior restoration to allow for freedom in anterior posterior movement. This was followed by glazing of the ceramometal crowns, and finally their cementation with phosphate cement (SuperCement, Shofu, Kyoto, Japan) (Figure 6,7).



Figure 7. Postoperative extraoral view.

Oral hygiene instructions were given and brushing technique was demonstrated. Recall evaluations were carried

out at 3-month intervals for a period of 1 year. The patient's esthetic and functional expectations were satisfied, and she did not have sensitivity or pain after the treatment.

Discussion

The patient described here was earlier diagnosed with hypoplastic AI, and complained of inferior esthetics, sensitivity to hot and cold, and decreased masticatory efficiency. Restorative treatment was indicated not only because of esthetic and functional concerns, but also to develop a positive psychological attitude in the patient. Various treatment options, such as vital tooth bleaching, direct composite veneers, ceramic laminates and posterior occlusal table-tops (Ivoclar Vivadent), pressable ceramic crowns, zirconia crowns, and ceramometal crowns, were considered. The former three options may be regarded as "conservative" in nature, while the latter three would require extensive removal of tooth structure during tooth preparation. Vital tooth bleaching has known disadvantages, such as relapse of discoloration after few years, and increased tooth sensitivity. Direct composite restorations have less longevity and abrasion resistance. Problems in bonding would be observed while using ceramic laminates and occlusal table-top restorations, and it would also become difficult to mask the discoloration through pressable ceramic restorations. Hence full coverage restorations, with adequate resistance and retention form were the restorations of choice. Patient preferred ceramometal restorations (non-precious alloy) over zirconia due to financial limitations. During tooth preparation, adequate retention form in posterior teeth was obtained by minimizing the cone angle taper of individual tooth preparations, and need for intentional endodontic treatment and crown lengthening surgery was obviated. Provisional restorations were provided to evaluate patient's response to treatment, and they were replaced later by definitive ceramometal restorations. Patient's esthetic and functional requirements were fulfilled after treatment, and no post operative complications were reported.

Summary

This clinical report describes the complete mouth rehabilitation of a patient affected with AI. Endodontic treatment of pulpally involved teeth, restoration of anterior guidance and full coverage restorations resulted in alleviation of tooth sensitivity and pain, improvement in esthetics, and enhanced in masticatory efficiency.

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