



## CASE REPORT

# Aesthetic full-mouth oral rehabilitation of a young adult with amelogenesis imperfecta: a clinical report

Onur Sahin, DDS, PhD,<sup>a</sup> Derya Ozdemir Dogan, DDS, PhD,<sup>b</sup> Fatih Sari, DDS, PhD<sup>c</sup>

<sup>a</sup>Department of Prosthodontics, Faculty of Dentistry, Bulent Ecevit University, Zonguldak, Turkey

<sup>b</sup>Department of Prosthodontics, Faculty of Dentistry, Cumhuriyet University, Sivas, Turkey

<sup>c</sup>Department of Prosthodontics, Faculty of Dentistry, Gaziantep University, Gaziantep, Turkey

## ARTICLE INFO

### Article history:

Received 24 February 2013

Accepted 08 July 2013

### Keywords:

Amelogenesis imperfecta  
Aesthetic full-mouth restoration  
Zircon- ceramic restorations

## ABSTRACT

Amelogenesis imperfecta (AI) encompasses a complicated group of hereditary conditions that cause developmental alterations in the structure of the enamel in the absence of a systemic disorder. AI primarily affects the quality and/or quantity of dental enamel, and it may affect all or only some of the teeth in the primary and/or permanent dentition. Treatment of a patient with amelogenesis imperfecta (AI) presents a real problem from both functional and esthetic points of view. An esthetic result also will result in an improvement in the patient's quality of life. This clinical report illustrates the oral rehabilitation of a 23-year-old woman diagnosed with hypomature type of AI. The aim of treatment was to both restore esthetics and improve masticatory function. Aesthetic and functional expectations were met zircon- ceramic restorations.

## INTRODUCTION

Amelogenesis imperfecta (AI) is a developmental, often inherited disorder affecting dental enamel.<sup>1</sup> This enamel anomaly affects both the primary and permanent dentitions.<sup>2-5</sup> AI has an estimated prevalence of approximately between 1:8000 and 1:700.<sup>6</sup> Transmission of the gene takes place by either autosomal or X linked dominant or recessive modes.<sup>7,8</sup> The most common type of AI is the autosomal dominant form.<sup>9</sup>

Investigators have demonstrated that it is possible to delineate at least 14 different hereditary subtypes of amelogenesis imperfecta exist with numerous patterns of inheritance and wide variety of clinical manifestations. On the clinical and radiographic basis alone, 3 broad groups can be distinguished: (1) hypoplastic, in which the enamel is reduced in quantity but is relatively well-mineralized; (2) hypocalcified, in which enamel is formed in relatively normal

\*Corresponding author at: Onur SAHIN, Department of Prosthodontics, Faculty of Dentistry, Bulent Ecevit University, Zonguldak, Turkey.  
Tel.: 0372 261 34 00, Fax: 0372 261 34 03, E-mail: sonurs60@hotmail.com

amounts but is poorly mineralized; and (3) hypomaturation, in which the final stages of mineralization process are abnormal.<sup>10-15</sup> According to the literature, AI patients, regardless of subtype, have similar oral complications. Apart from enamel defects, AI also has been associated with inclusions and abnormalities in dental eruption, teeth sensitivity, poor dental esthetics, and decreased occlusal vertical dimension.<sup>16</sup> Although the AI subtype and severity may limit potential treatment options, a recently published survey reported the importance of treating the AI patient not only from a functional standpoint, but also from a psychosocial health standpoint.<sup>16,17</sup> Restoration of these defects is important not only because of aesthetic and functional concerns, but also because there may be a positive psychological impact for the patient.<sup>10-17</sup> Treatment planning for patients with AI is related to many factors. The age and socioeconomic status of the patient, the type and severity of the disorder, and the intraoral situation at the time the treatment is planned.

## CASE REPORT

The patient, 23 years old was referred to the Department of Prosthodontics, Faculty of Dentistry, Cumhuriyet University. She suffered from aesthetic inadequacy and sensitivity of the teeth. She was also unable to chew food. A detailed medical and dental examination was performed. Her medical story and general physical condition were unremarkable. Patient's parents were examined and none of them showed similar condition. Clinically, tissue loss affected all teeth. It was learned that her she was referred to Department of Pediatric Dentistry of Cumhuriyet University (Sivas, Turkey) 11 years ago. Direct resin composite restorations and stainless steel crowns were made to protect vertical dimension of occlusion. The restorations also provided an excellent transitional restorative alternative until completion of skeletal growth.

Clinical and radiographic examination of the patient (Figure 1) revealed short clinical crowns, attrition, severe tooth hypersensitivity, exposed dentin, stainless



**Figure 1.** Pretreatment intraoral photographs and panoramic radiograph.

steel crowns, fractured composite restorations, and decreased vertical dimension; however, oral hygiene was satisfactory. The patient's mandibular left second incisor was extracted and stainless steel crowns were made.

A treatment plan was developed that would include treatments to reduce the reported sensitivity, restore masticatory function to improve aesthetics and vertical dimension. Maxillary and mandibular teeth were prepared for zircon-porcelain restoration by using medium and coarse diamond burs (2135 KG Sorensen, Barueri, Sao Paulo, Brazil). Margins were finished with a chamfer cervical finish line with a fine diamond bur (4023 KG Sorensen, Barueri, Sao Paulo, Brazil). Complete arch impressions were made with a silicone impression material (Durosil L. PD President, Germany) by using putty-wash two-step impression technique for provisional restorations that were fabricated at an increased occlusal vertical dimension (4 mm), lined with methyl methacrylate acrylic resin (Major C&BV Dentine Major, Moncelieri, Italy) in the laboratory. The craniomaxillary and maxillamandibular relationship in the centric relation was recorded on a semiadjustable articulator (Hanau Articulator, Teledyne Hanau Buffalo, NY, USA) Provisional restorations were cemented with zinc-oxide eugenol temporary cement (Temp Bond; Kerr Corp Orange, CA, USA). After 3 months with provisional restorations without any complication, patient was recalled and provisional restorations were removed. Final impressions were made by using silicone impression material (Durosil L. PD President, Germany) by using putty-wash two-step impression technique. For the cast models Type IV die stone (Bego Bremer Goldschlagerei Herbst GMBH Germany) were used with the semiadjustable articulator (Hanau Articulator, Teledyne Hanau Buffalo, NY, USA). Analogs of

zirconium cores (T Rigid, Zirkozahn Gmbh, Italy) were examined in mouth and zirconium copings were fabricated with MAD-MAM (Manual Aided Design-Manual Aided Manufacture) analog system (ICE Zirkon, ZirkonZahn, Italy). Shade selection was done with the patient's consent in conformation with her complexion. Layering porcelain (VITAVM-9 Enamel Porcelain, VITA, Bad Sackingen, Germany) was used to complete the all ceramic crowns. The marginal fit and occlusion of the crowns was evaluated intraorally and then the crowns were cemented one by one with zinc polycarboxylate cement (Poly-F Plus Bondex, Dentsply Detrey GmbH, Konstanz, Germany). Canine-protected occlusion and anterior guidance were preserved in the definitive restorations to decrease lateral forces on the posterior dentition.

After prosthetic rehabilitation, patient's aesthetic expectation was established (Figure 2). Former complaints about teeth sensitivity had no seen any more. The patient was monitored at 3-month intervals for 12 months. The restorations were intact, without discoloration, or caries lesions (Figure 3). Patient's aesthetic and functional expectations were also satisfied and had no TMJ problem.

## DISCUSSION

There are a number of alternatives for the treatment of teeth affected by AI. The fixed prosthodontic treatment selected, albeit invasive, is more conservative than other considered alternatives. Other treatment methods involving extractions of remaining teeth and placement of removable prostheses or extractions of remaining teeth combined with implant-supported fixed or removable prosthodontics are considerably more radical and have greater incidence of clinical complications than conventional fixed and removable prosthodontics.<sup>5,18</sup> This patient wished to retain as much of



**Figure 2.** Posttreatment frontal and sagittal views of teeth maximum intercuspation.



**Figure 3.** Frontal and sagittal views of teeth after 12 months of the treatment.

his natural dentition as possible. Although allceramic fixed partial dentures are more expensive than metal-ceramic fixed partial dentures, they are more aesthetically pleasing than the others.<sup>19</sup>

An introduction of zirconia-based core ceramics provides more predictable treatment options for the posterior teeth where the high chewing loads are applied. The CAD/CAM technology also allows the possibility of using either partially or fully sintered zirconium dioxide blanks to fabricate frameworks and copings. Not only the fabricating technology that makes zirconia-based ceramics a material of choice for fabrication of fixed partial dentures, the high fracture resistance of zirconia-based materials that could withstand high occlusal loads has been the major advantage of these materials.<sup>20</sup>

According to the results from the reviewed clinical studies, zirconia frameworks have been shown that they could provide a strong support to a veneering layer because of their high fracture resistance.<sup>21-25</sup> Not only high fracture resistance but also aesthetic advantages we preferred zircon-ceramic restoration for full-mouth rehabilitation.

The chamfer is easy to produce, provides space for an adequate bulk of restorative material, allows for a slip-joint effect, and is distinct and readily identifiable to both the dentist and the laboratory technician. More than possessing sound mechanical properties, the chamfer finish line design exhibits low stress levels in photoelastic studies,<sup>26</sup> which may reduce stress-induced cement failure.<sup>27</sup> Cervical finish line type has an influence on the marginal adaptation



of zirconia restorations both shoulder and mini-chamfer exhibited the least marginal opening values for zirconia crowns and can be recommended for clinical applications.<sup>28</sup> Increasingly, zirconium-based crowns and bridges are being used in place of porcelain-fused-to-metal ones. As with the porcelain-fused-to-metal restoration, it is possible for the technician to trim the coping back in order to create a more natural cervical margin. For this reason it is likely that if and when gingival recession occurs the resulting visible margin will most likely be less offensive than the exposed margin of porcelain-fused-to-metal restoration. A deep chamfer is again the ideal marginal preparation to allow for the zirconium coping and overlying veneering ceramic.<sup>29</sup> Although 90° shoulder with a rounded axiokingival line angle design is recommended for the preparation of all-ceramic and metal-ceramic crowns, rather than a chamfer preparation,<sup>30</sup> the rheological properties of zirconia framework material differ from these materials in many aspects, such as creep behavior.<sup>31</sup>

In this case report we preferred chamfer finish line as it is easy to prepare and has good marginal adaptation.

The appearance of the face has an important social and psychological effect on the human personality and features most commonly associated with the facial attraction are the eyes and the mouths.<sup>32</sup> If some natural teeth remain in mouth, the procedure is to select artificial teeth that blend with natural dentition. However, the choice of artificial teeth can be more complex if patients request reproduction of features present in the natural dentition such as staining, tooth irregularities or tooth wear.<sup>33</sup>

Dentists have often selected the form of anterior tooth according to the shape of the patient's face. This system of selection was

developed in the early 1900s by Williams,<sup>34</sup> but later investigations have shown that neither the form nor the size of the tooth correlates significantly with sex or the shape of the face.<sup>35-37</sup> Numerous methods have been devised for determining form of artificial teeth. Although no universally method has been found Williams method is the most accepted.<sup>38</sup> Cilinican's aesthetic sensitivity and patients' opinions and desire should be taken into account so treatment rendering will be in harmony with the facial appearance of each individual.

According to Seow<sup>16</sup> the primary clinical problems of AI are esthetics, dental sensitivity, and loss of occlusal vertical dimensions. Historically, treatment of patients has included multiple extractions and the fabrication of complete dentures.<sup>11,16</sup> These options are psychologically harsh when the problem must be addressed in adolescent patients.<sup>11</sup> In our case the patient has had satisfactory oral hygiene and did not lose her tooth thanks to the regular dentist visit since her childhood therefore restoration of the dentition using a fixed restoration was possible. Most authors prefer all-ceramics restorations as the treatment modality of their patient with AI.<sup>11,39,40-42</sup> However, the advances in the field of esthetic dentistry, especially in bonding to dentin, help practitioners to restore function and esthetics to an acceptable level.<sup>11,41</sup> Nevertheless, marginal adaptation and bonding problems have been pointed out as disadvantages of laminate veneers.<sup>42,43</sup> In some instances, high strength ceramic restorations do not require adhesive bonding to tooth structure and can be placed using conventional cements which rely only on micromechanical retention.<sup>44</sup> However, the laminate restorations has better esthetic appearance and more conservative approach, their marginal adaptation and bonding problems caused not to prefer as our treatment technique. In our case, full-mouth zirconia all-ceramic porcelain

restorations were preferred to not only for improved mechanical performance, but also to recover esthetics. In AI patients the primary purpose should be to regain the psychosocial trust by analyzing aesthetic and functional problems.<sup>45</sup>

## CONCLUSION

The complexity of the management of patients with AI supports the supposition that the prosthodontic discipline should have a key position in the rehabilitation of rare disorders. With careful considerations of patient expectations and requests, an inter-disciplinary approach was critical for a successful outcome and patient satisfaction.

## REFERENCES

1. Lykogeorgos T, Duncan K, Crawford PJ, Aldred MJ. Unusual manifestations in X-linked amelogenesis imperfecta. *Int J Paediatr Dent* 2003;13:356-361.
2. Aldred MJ, Savarirayan R, Crawford PJM. Amelogenesis imperfecta: A classification and catalogue for the 21st century. *Oral Dis* 2003;9:19-23.
3. Neville BW, Damm DD, Allen CM, Bouquot JE. *Oral and maxillofacial pathology*. 2nd ed. Philadelphia (PA): Elsevier; 2002;89-94.
4. Sanchez-Quevedo MC, Ceballos G, Garcia JM, et al. Dentine structure and mineralization in hypocalcified amelogenesis imperfecta: A quantitative x-ray histochemical study. *Oral Dis* 2004;10:94-98.
5. Coley-Smith AC, Brown CJ. Case report: Radical management of an adolescent with amelogenesis imperfecta. *Dent Update* 1996;23:434-435.
6. Crawford PJ, Aldred MJ. X-linked amelogenesis imperfecta. Presentation of two kindreds and a review of the literature. *Oral Surg Oral Med Oral Pathol* 1992;73:449-455.
7. Nusier M, Yasin O, Hart TC, et al. Phenotypic diversity and revision of the nomenclature for autosomal recessive amelogenesis imperfecta. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:220-230.
8. Türkün LS. Conservative restoration with resin composites of a case of amelogenesis imperfecta. *Int Dent J* 2005;55:38-41.
9. Bsoul SA, Flint DJ, Terezhalmay GT, Moore WS. Amelogenesis imperfecta. *Quintessence Int* 2004;35:338-339.
10. Witkop CJ, Sauk JJ. Heritable Defects of Enamel. In: Stewart R, Prescott G. *Oral Facial Genetics*. St. Louis: C.V. Mosby Company, 1976;151-226.
11. Sari T, Usumez A. Restoring function and esthetics in a patient with amelogenesis imperfecta: A clinical report. *Prosthet Dent* 2003;90:522-525.
12. Winter GB, Lee KW, Johnson NW. Hereditary amelogenesis imperfecta-a rare autosomal dominant type. *Br Dent J* 1969;127:157-164.
13. Witkop CJ. Partial expression of sex-linked recessive amelogenesis imperfecta in females compatible with the Lyon hypothesis. *Oral Surg* 1967;23:174-182.
14. Witkop JR CJ, Kuhlmann W, Sauk J. Autosomal recessive pigmented hypomaturation amelogenesis imperfecta. Report of a kindred. *Oral Surg Oral Med Oral Pathol* 1973;36:367-382.
15. Haug RH, Ferguson FS. X-linked recessive hypomaturation amelogenesis imperfecta: report of case. *J Am Dent Assoc* 1981;102:865-867.
16. Seow WK. Clinical diagnosis and management strategies of amelogenesis imperfecta variants. *Pediatr Dent* 1993;15:384-393.
17. Coffield KD, Phillips C, Brady M,

- et al. The psychosocial impact of developmental dental defects in people with hereditary amelogenesis imperfecta. *J Am Dent Assoc* 2005;136:620-630.
18. D. Goodacre CJ, Guillermo B, Rungcharassaeng, Kan JYK. Clinical complications with implant with implants and implant protheses. *J Prosthet Dent* 2003;90:121-132.
  19. Doruk C, Ozturk F, Sari F, Turgut M. Restoring Function and Aesthetics in a Class II Division 1 Patient with Amelogenesis Imperfecta: A Clinical Report. *European Journal of Dentistry* 2011;5:220-228.
  20. Triwatana P, Nagaviroj N, Tulapornchai C. Clinical performance and failures of zirconia-based fixed partial dentures: a review literature. *J Adv Prosthodont* 2012;4:76-83.
  21. Sua'réz MJ, Lozano JF, Paz Salido M, Martl'nez F. Three-year clinical evaluation of In-Ceram Zirconia posterior FPDs. *Int J Prosthodont* 2004;17:35-38.
  22. Vult von Steyern P, Carlson P, Nilner K. All-ceramic fixed partial dentures designed according to the DC-Zirkon technique. A 2-year clinical study. *J Oral Rehabil* 2005;32:180-187.
  23. Raigrodski AJ, Chiche GJ, Potiket N, Hochstedler JL, Mohamed SE, Billiot S, DE. The efficacy of posterior three-unit zirconium-oxide-based ceramic fixed partial dental prostheses: a prospective clinical pilot study. *J Prosthet Dent* 2006;96:237-244.
  24. Sailer I, Fehe'r A, Filser F, Luthy H, Gauckler LJ, Scharer P, Franz Hammerle CH. Prospective clinical study of zirconia posterior fixed partial dentures: 3-year follow-up. *Quintessence Int* 2006;37:685-693.
  25. Sailer I, Fehe'r A, Filser F, Gauckler LJ, Luthy H, Hammerle CH. Five-year clinical results of zirconia frameworks for posterior fixed partial dentures. *Int J Prosthodont* 2007;20:383-388.
  26. El-Ebrashi MK, Craig RG, Peyton FA. Experimental stress analysis of dental restorations: part III—the concept of the geometry of proximal margins. *J Prosthet Dent* 1969;22:333-345.
  27. Shillingburg HT, Hobo S, Whitsett LD, Jacoby R, Brackett SE. *Fundamentals of fixed prosthodontics*. 3<sup>rd</sup> ed. Carol Stream, IL: Quintessence Publishing Co., 1997.
  28. Comlekoglu M, Dundar M, Özcan M, Gungor M, Gokce B, Artunc C. Influence of Cervical Finish Line Type on the Marginal Adaptation of Zirconia Ceramic Crowns. *Oper Dent* 2009;34:586-595.
  29. Newsome P, Owen S. Ceramic veneers in general dental practice. Part three: clinical procedures. *International Dentistry SA* 2009;11:38-39.
  30. Rinke S, Huls A, Jahn L. Marginal accuracy and fracture strength of conventional and copy-milled all-ceramic crowns. *Int J Prosthodont* 1995;8:303-310.
  31. Rodriguez-Dominguez A, Mora-Gutierrez F, Melendo-Jimenez M, Routbort JL, Chaim R. Current understanding of super plastic deformation of Y-TZP and its application to joining. *Mater Sci Eng* 2001;A302:154-161.
  32. Baldwin DC. Appearance and esthetics in oral health. *Community Dent Oral Epidemiol* 1980;8:224-256.
  33. Relationship Between the Face and the Tooth Form L. Ibrahimagic, V. Jerolimov, A. Celebic V. Carek, I. Bauicicand D. Knezovic Zlataric *Coll Antropol* 2001;25:619-626.
  34. Williams LA. A new classification of humant ooth forms with special reference to a new system of artificial teeth. *Dent Cosmos* 1914;56:627-631.
  35. Mavroskoufis F, Ritchie M. The face form as a guide for selection of

- maxillary central incisors. J Prosthet Dent 1980;43:501-505.
- 36.** Sellen P. N, Phil B, Jagger D. C., Harrison A, Computer-generated study of the correlation between tooth, face, arch forms and palatal contour. J Prosthet Dent 1998;80:163-8.
- 37.** Seluk LW, Brodtbelt RHW, Wacker GF. A biometric comparison of face shape with denture tooth form. J Oral Rehabil 1987;14:139-145.
- 38.** Sellen PN, Jagger DC, Harrison A. Method used to select artificial teeth for the edentulous patient: A historical overview. Int J Prosthodont 1999;12:51-58.
- 39.** Gökçe K, Canpolat C, Özel E. Restoring function and esthetics in a patient with amelogenesis imperfecta: a case report. J Contemp Dent Pract 2007;8:90-101.
- 40.** Toksavul S, Ulusoy M, Türkün M, Kümbüloğlu Ö. Amelogenesis imperfecta: the multidisciplinary approach: a case report. Quintessence Int 2004;35:11-14.
- 41.** Christensen GJ. Porcelain-fused-to-metal *versus* nonmetal crowns. J Am Dent Assoc 1999;130:409-411.
- 42.** Ozturk N, Sari Z, Ozturk B. An interdisciplinary approach for restoring function and esthetics in a patient with amelogenesis imperfecta and malocclusion: a clinical report. J Prosthet Dent 2004;92:112-115.
- 43.** Canger EM, Celenk P, Yenisey M, Odyakmaz SZ. Amelogenesis Imperfecta, Hypoplastic Type Associated with Some Dental Abnormalities: A Case Report. Braz Dent J 2010;21:170-174.
- 44.** Thompson JY, Stoner BR, Piascik JR, Smith R. Adhesion/cementation to zirconia and other non-silicate ceramics: where are we now? Dent Mater 2011;27:71-82.
- 45.** Ayna B, Ayna E, Hamamcı N, Çelenk S, Bolgöl B. Restoring function and esthetics rehabilitation in two patients with amelogenesis imperfecta: case report. Cumhuriyet Dent J 2008;11:113-117.

**How to cite this article:** Onur Sahin, Derya Ozdemir Dogan, Fatih Sari. Aesthetic full-mouth oral rehabilitation of a young adult with amelogenesis imperfecta: a clinical report. Cumhuriyet Dent J 2014;17(3):308-315.