Case Report

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2018;7:2:174-180.

Smile Recontouring in Amelogenesis Imperfecta: An Integrated Paradigm Shift

Sakshi Anand[1*] P Laxman.Rao[2]

[1]Senior Lecturer, Department of Prosthodontics, Army College of Dental Sciences, Secunderabad, India.
[2]Professor and Head, Department of Prosthodontics, Army College of Dental Sciences, Secunderabad, India.

ABSTRACT

BackgroundThe use of high strength ceramics like zirconia has enhanced the predictability of ceramics especially in the posterior region. Its application to the dental field has broadened the design and application limits of all-ceramic restorations. Combined with CAD/CAM technology, the fabrication of extensive zirconia restorations has become a simple and an accurate procedure. Also, these restorations are characterized by enhanced aesthetic properties, optimal integration to gingival tissues, good biocompatibility and a high level of accuracy. This article discusses the successful full mouth rehabilitation of a young patient with Amelogenesis imperfecta through the use of CAD-CAM fabricated zirconia based all- ceramic restoration.

Keywords: Zirconia; All-Ceramic; CAD-CAM; Full mouth rehabilitation; Amelogenesis imperfecta.

INTRODUCTION

Several innovative systems for fabricating all-ceramic dental restorations were introduced towards the end of the twentieth century. Among these, Zirconia based materials are one of the most widely used materials in dentistry.[1] Machinable zirconia is predominately zirconia with stabilizing components such as yttrium and minor components such as alumina, which are important for long term stability.[1] Zirconia is biocompatible and promotes low bacteria adhesion. Moreover, it has colours similar to natural teeth, and it is opaque, which is desirable to treat dischromic teeth[2-4] such as those found in patients with Amelogenesis imperfecta.

Amelogenesis imperfecta is a heterogeneous inherited disorder that disturbs the developing enamel structure and exists independent of any related systemic disorder.[5-7] This enamel anomaly affects both the primary and permanent dentitions.[6-9] The prevalence of this rare ectodermal defect has been reported to vary between approximately 1:700 and 1:16,000 depending on the population studied and the diagnostic criteria used.[10] Apart from enamel defects, Amelogenesis imperfecta also has been associated with inclusions and abnormalities in dental eruption, teeth sensitivity, poor dental aesthetics, and decreased vertical dimension.[11]

Restoration of Amelogenesis imperfecta defects is important not only because of aesthetic and functional concern, but also because there may be a positive psychological impact on the patient. Among various treatments described for rehabilitation of Amelogenesis imperfecta, this case report describes the rehabilitation of patient with Amelogenesis imperfecta with full mouth zirconia crowns with the aim of restoring masticatory function, reducing the reported tooth sensitivity, and improving the patient's appearance.

CASE REPORT

A 24-year-old healthy male patient reported to the Department of Prosthodontics, Army College of Dental Sciences, Secunderabad, dissatisfied with the

Received: Sept. 23, 2017: **Accepted:** Nov. 12, 2017
***Correspondence Dr. Sakshi Anand.**
Department of Prosthodontics, Army College of Dental Sciences, Secunderabad, India.
Email: sakshianand26@yahoo.co.in

pISSN 2278-0076
eISSN 2321-9270

Fig 1: Preoperative full-face image.

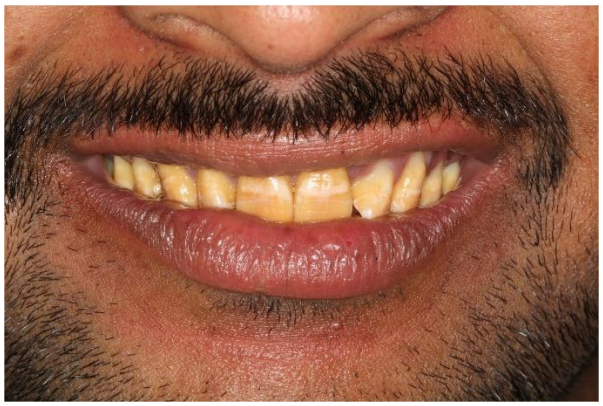

Fig 2: Preoperative smile.

Fig 3: Preoperative panoramic radiograph.

Fig 4: Diagnostic maxillary cast.

Fig 5: Diagnostic mandibular cast.

Fig 6: Preoperative retracted front view.

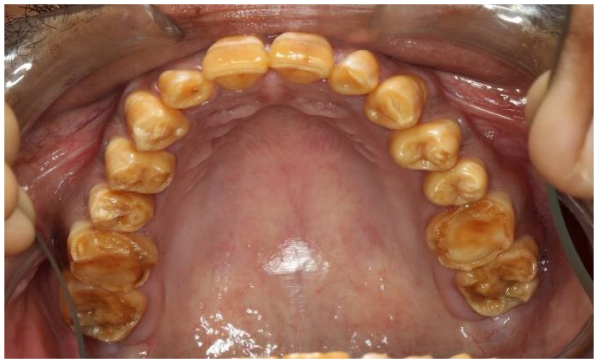

Fig 7: Preoperative maxillary occlusal view.

Fig 8: Preoperative mandibular occlusal view.

Fig 9: Preoperative left lateral view.

Fig 10: Preoperative right lateral view.

Fig 11: Preoperative view of the maxillary anterior teeth.

Fig. 12: Postoperative retracted front view of the full-mouth restorations.

Fig 13: Postoperative maxillary occlusal view of the restoration.

Fig 14: Postoperative mandibular occlusal view of the restoration.

Fig 15: Postoperative right lateral view of the restored teeth.

Fig 16: Postoperative left lateral view of the restored teeth.

Fig 17: Postoperative view of the restored maxillary anterior teeth.

Fig 18: Postoperative view of the restored mandibular anterior teeth.

Fig 19: Canine-Guided occlusion.

appearance of his teeth. He complained of generalized sensitivity to cold and hot food and beverages and also difficulty in chewing food. He suffered from low self- esteem because of his existing unattractive teeth. (Figure 1, 2)

Fig 20: Postoperative smile.

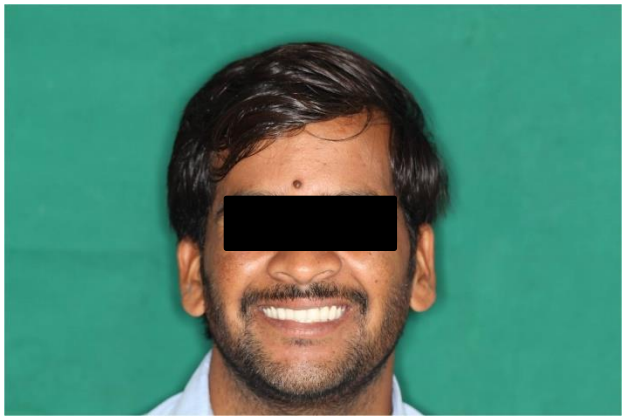

Fig 21: Postoperative full-face image.

Initial evaluation of patient included a detailed social, dental and medical history. Diagnostic information, including full-mouth, panoramic, and temporomandibular joint radiographs was gathered, and gingival tissues were checked. (Figure 3) Complete arch impressions to fabricate maxillary and mandibular diagnostic casts were made (Figure 4, 5) and were mounted in centric relation on a semi-adjustable articulator (Whip Mix Model 8500, USA) using a face-bow transfer and an interocclusal record. As the patient had 3-4 mm of interocclusal distance, the vertical dimension was not altered. Complete intraoral and extraoral digital photographs were taken. (Figure 6, 7, 8, 9, 10, 11) Periodontal charting enabled recording of furcation involvement, mobility, pocket depths, bleeding sites, and other gingival abnormalities.

The patient was diagnosed with Amelogenesis imperfecta after detailed clinical and radiological examination. The patient had hypocalcified enamel, improper intercuspation and lack of proximal contact because of tooth surfaces loss. A portion of

the dentin in relation to 16, 26, 36 and 46 had been lost due to lack of treatment which led to chronic pain. Patient had good oral hygiene, was caries-free, and did not exhibit any periodontal problems.

Mounted casts, radiographs, periodontal chart, and digital charts were studied. In addition, the patient's face was studied carefully during planning to ensure that his final smile design would match his personality. The patient's entire enamel was affected and was prone to decay. Therefore conservative approaches like inlays and onlays were not considered in his case. Full-coverage zirconia based all-ceramic restorations were planned for all the teeth.

The patient was informed about the restorative procedure and all other treatment alternatives including the differences in costs, the amount of tooth structure removal, the expected clinical longevity, the time period necessary to conclude the treatment, and the possible aesthetic results. Informed consent was obtained from the patient and treatment was initiated.

Procedure

The patient underwent a complete oral hygiene regimen. Root canal treatment was done in relation to 16, 26, 36, and 46. Following a dental prophylaxis and hygiene instruction, the patient was placed on a 0.12% chlorhexidine gluconate oral rinse, with a recommended use of twice daily. Biomechanical tooth preparation to receive zirconia crowns was done in a phased approach. Gingival retraction (SURE-Cord, Sure Dent Corporation, Korea) was was done to accurately record finish lines in the definitive impressions. Dental impressions were made with a polyvinylsiloxane material (Aquasil Dentsply, Germany) using a double-mix single step technique. Provisional crowns were cemented with temporary cement (Tempo SIL 2, Coltene Whaledent, Switzerland). Shades for the definitive restorations were determined prior to and reviewed after biomechanical tooth preparation. Dental impressions, bite registration, models, a compact disc with the patient's photographs, and the detailed prescription were sent to the dental laboratory.

Gypsum model with individual die was created. Every single tooth was scanned in a CAD-CAM Scanning unit (Dental Wings Scanner, Montreal, Canada). In the virtual model obtained, the dental technician designed zirconia copings using the DWOS software. The designed copings were milled in a CAM unit (Yenadent D40, Canada) using Zirconium oxide partially stabilized with yttrium blocks (Czar Blocks, Metoxit, Switzerland). All copings were tested to check their adaptation to the respective abutments, and no marginal gaps were detected. Copings were then veneered with IPS Empress 2 materials (Ivoclar Vivadent AG, Schaan, Liechtenstein). After evaluation of definitive restorations for optimal contacts, contours and aesthetics, they were cemented using luting cement. All restorations and interproximal areas were cleaned of residual cement. (Figure 12,13,14,15, 16, 17, 18, 19, 20). The patient was scheduled for a recall visit.

The examinations were carried out at the point of final cementation (baseline). Data were obtained using interview in conjunction with a clinical evaluation. Patient's feedback about aesthetics, pain, and sensitivity to heat or cold, root sensitivity and gingival bleeding were recorded. The periodontal condition of the abutment teeth (bleeding on probing and periodontal pockets), location of the gingival margins in abutment teeth and caries/restorations in abutment teeth were evaluated. The crown margin excess and marginal fidelity were examined using a probe. Radiographic evaluation of the abutment teeth was completed using intraoral radiographs.

It was found that patient had no complaint of pain and sensitivity. The periodontal health of the abutment teeth was satisfactory. Carious lesions were not found in abutment teeth. Marginal fidelity was good. Patient was satisfied with the final aesthetic outcome and occlusion. (Figure 19, 20, 21).

DISCUSSION

There are a number of treatment modalities for the prosthetic rehabilitation of defective enamel in Amelogenesis patients. They are related to factors such as: age and socioeconomic status of the patient, type and severity of the disorder, and intraoral situation at the time the treatment was

planned.[12] Prosthodontic management of Amelogenesis imperfecta with bonded porcelain inlays, stainless steel crowns, and metal-ceramic crowns, were not considered in the treatment of this patient because of his high aesthetics expectations and young age, which created the need for a predictable long term prognosis.[13]

The restoration of aesthetics and function in patients with Amelogenesis imperfecta may be achieved with a dedicated team approach. In this case, meticulous attention to detail, from diagnosis to post delivery monitoring, allowed a controlled and logical treatment sequence.[13]

Zirconia is currently the strongest and most stable ceramic material on the market. The use of the zirconium oxide all-ceramic material provides several advantages, including a high flexural strength (1000 MPa) and desirable optical properties, such as shading adaptation to the basic shades and a reduction in the layer thickness (compared to conventional ceramics) of the veneer ceramic required to achieve the desired color.[14,15]

In comparison to Al2O3 ceramics, ZrO2 ceramics usually have twice the flexural strength and fracture toughness. The main reason for the superior fracture strength of ZrO2 ceramic lies in the metastable tetragonal crystalline structure at room temperature. This structure represents an efficient mechanism against flaw propagation. In contrast, ZrO2 ceramic exhibits thermal conductivity values 1 to 10 times lower than Al2O3 ceramic. Therefore, ZrO2 abutments should be more at risk to fail than Al2O3 by heat-producing surface treatments that produce high-temperature spots because of the very low heat dissipation of the material. In addition, grinding ZrO2 ceramic induces surface flaws and micro cracks, which influence the fracture resistance of the material. The strength and fracture toughness have often been the first parameters investigated to understand the clinical potentiality and limits of any dental ceramic. Therefore, zirconia has been developed with the aim of providing a stronger and tougher material to the dental speciality.

CONCLUSION

Considering the limitations of the observational period, the excellent survival rate of zirconia restorations fabricated using the Zirconium oxide partially stabilized with yttrium blocks (Czar blocks, Metoxit, Switzerland) indicates this type of ceramic to be an alternative to metal-ceramic restorations.

Also, with careful considerations of patient expectations and requests, an interdisciplinary approach is critical for a successful outcome and patient satisfaction.[16] Having an excellent working relationship with a dental laboratory is highly recommended.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Russel Giordiano II. Zirconia: A proven, durable ceramic for esthetic restoration. Compendium 2012; 33:46-9.

2. Manicone PF, Rossi IP, Raffaelli L. An overview of zirconia ceramics: basic properties and clinical applications. J Dent 2007; 35:819-26.

3. Kunii J, Hotta Y, Tamaki Y, Ozawa A, Kobayashi Y, Fujishima A, et al. Effect of sintering on the marginal and internal fit of CAD/CAM-fabricated zirconia frameworks. Dent Mater J 2007; 26:820-6.

4. Pilathadka S, Vahalová D, Vosáhlo T. The Zirconia: a new dental ceramic material. An overview. Prague Med Rep 2007; 108:5-12.

5. Bsoul SA, Flint DJ, Terezhalmy GT, Moore WS. Amelogenesis imperfecta. Quintessence Int 2004; 35:338–9.

6. Aldred MJ, Savarirayan R, Crawford PJM. Amelogenesis imperfecta: a classification and catalogue for the 21st century. Oral Dis 2003; 9:19–23.

7. Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology. 2nd ed. Philadelphia (PA): Elsevier; 2002, p. 89–94.

8. Sanchez-Quevedo MC, Ceballos G, Garcia JM, et al. Dentine structure and mineralization in hipocalcified amelogenesis imperfecta:a

quantitative x-ray histochemical study. Oral Dis 2004; 10:94–8.

9. Coley-Smith AC, Brown CJ. Case report: radical management of an adolescent with amelogenesis imperfecta. Dent Update 1996; 23:434–5.

10. Sundell S, Koch G. Hereditary amelogenesis imperfecta. Epidemiology and clinical classification in a Swedish child population. Swed Dent J 85; 9:157–69.

11. Seow WK. Clinical diagnosis and management strategies of amelogenesis imperfecta variants. Pediatr Dent 1993; 15:384–93.

12. Sengun A, Ozer F. Restoring function and esthetics in a patient with amelogenesis imperfecta: a case report. Quintessence Int 2002; 33:199–204.

13. Williams WP, Becker LH. Amelogenesis imperfecta: functional and esthetic restoration of severely compromised dentition. Quintessence Int 2000; 31:397–403.

14. Della Bona A, Anusavice KJ, Hood JA. Effect of ceramic surface treatment on tensile bond strength to a resin cement. Int J Prosthodont 2002; 15:248-53.

15. Derand P, Derand T. Bond strength of luting cements to zirconium oxide ceramics. Int J Prosthodont 2000; 13:131-5.

16. Bergendal B. The role of prosthodontists in habilitation and rehabilitation in rare disorders. Int J Prosthodont 2001; 14:466–70.