METAL CERAMIC RESTORATIONS FOR FULL MOUTH REHABILITATION IN AMELOGENESIS IMPERFECTA

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ABSTRACT Amelogenesis imperfecta (AI) is a clinical condition of natural teeth in which enamel fails to mature, due to which the patient faces sensitivity, attrition and poor aesthetics. The condition is genetically inherited and requires multidisciplinary treatment planning to succeed effectively. Treatment ranges from individual crowns to fixed partial dentures or implant-supported single crowns and is related to multiple factors like age and condition of remaining natural teeth. In such cases, using metal and ceramic restorations requires knowledge and understanding of basic material science, which helps improve the treatment’s efficiency. This article presents a case of a young adult male patient who presented with AI with a chief complaint of poor esthetics. Maxillary and mandibular teeth had undergone attrition with concomitant loss of anterior guidance. The occlusion was successfully established after restoring anterior guidance, which was determined by using temporary crowns. Porcelain fused to metal restorations was given, and the patient was put on a long-term follow-up. The patient was highly satisfied with the outcome of the rehabilitation.

KEYWORDS cast restoration, metal, ceramic, full mouth rehabilitation, endodontic, crown lengthening

Introduction

Amelogenesis imperfecta (AI) affects enamel mineralization that is genetically determined and inherited, causing a defect of enamel that covers the natural tooth structure in all-natural denticitions.[1] It is also called hereditary brown teeth, the clinical appearance of such teeth.[2] Enamel may be present in some cases. However, it is soft and friable rather than hard.[3] The pathology is basically due to defects in the final phase of the mineralization process. It is not a single condition but a group of complex hereditary enamel defects that are not associated with any systemic disease.[4] Its prevalence is reported to be 1:14 000 and affects the tooth qualitatively and quantitatively.[5] Since enamel is an essential component of maintaining proper occlusion, the impact of the absence of enamel influences the normal functioning of occlusion. The relationship and the effect of an ideal or abnormal occlusion on the temporomandibular joint and the entire stomatognathic system are well established,[6] with evidence suggesting that abnormalities in the stomatognathic system are either a direct or indirect consequence of impaired occlusion.[7] Besides the natural attrition of normal enamel in the presence of abnormal parafunctional habits (bruxism and clenching), the choice of the fixed partial denture in the rehabilitation of such cases causes further reduction of natural tooth structure that is already compromised.[8] In addition to enamel defects, patients have also been reported to have delayed eruption of teeth, taurodontism, missing teeth, root resorption and calcifications of the pulp.[9] Regardless of the type or subtype, patients face similar oral complications like sensitivity, poor aesthetics, decreased vertical dimension of occlusion, food lodgement and attrition.[10]

A better understanding of the occlusal concept of prosthetic dentistry in terms of biological and mechanical principles has allowed these patients with treatment options that primarily include fixed individual crowns, fixed partial dentures, or implant-supported crowns when some teeth are missing.[11] Fixed Prosthodontic treatment involving conventional metal,
and ceramic crowns, have revolved in their management since the 1970s and continues to be one of the most economical alternatives for patients unable to afford all-ceramic or implant-supported prosthetic options.[12] Success of metal and ceramic restorations is primarily attributed to biological, mechanical and aesthetic principles that must be followed if one chooses such treatment options.[13] The AI treatment plan is based not only on the choice of materials but also on factors like age, socioeconomic status, type and severity and the long-term occlusion function.[14] A multidisciplinary approach is compulsory for effective management, which should be objectively aimed at a comprehensive treatment of the condition.

Case presentation

A young male patient aged 32 years was referred from medical college to the department of Prosthodontics to seek an opinion regarding the poor appearance of naturally stained teeth. Patients' Medical, social, drug and dental history were within normal clinical limits. Familial history revealed that similar conditions existed in a few siblings of his family. Extra oral examination presented a convex facial profile (Fig 1A) with short mandibular lip and excessive exposure of anterior maxillary teeth while speaking or smiling. Intraoral examination revealed a generalized discoloration of maxillary and mandibular teeth, with the colour of the teeth looking brown throughout the length and width of each natural tooth (Fig 1B). Mandibular teeth also presented some degree of attrition on the occlusal and the labial aspect, especially anteriorly (Fig 1C). A detailed biochemical, radiographic and diagnostic cast mounting was performed to rule out any hidden systemic disturbance. A diagnostic wax-up (Bego, Wilhelm-Herbst, Germany) revealed that the patient was an ideal candidate for full mouth rehabilitation (FMR), with a chief feature being to establish a new occlusal scheme in the patient. The patient was given the option of individual all-ceramic crowns entirely and porcelain fused to metal posteriorly as the first choice. The second choice is porcelain fused to metal, with ceramic crowns for both arches. The patient consented and agreed to porcelain fused to metal crowns for all teeth. All treatments, irrespective of the department, were carried out following strict infection control guidelines [15] and the protocol for Prosthodontic treatment during the covid 19 pandemic.[16] FMR was initiated by undergoing thorough oral prophylaxis, after which intentional endodontic treatment was done for all-natural teeth (Fig 2A). As part of pre-prosthetic mouth preparation, most of the areas on the labial, buccal and lingual sides went for gingivectomy that ranged from 1 mm to 4 mm in height from gingival margins (Fig 2B). After completing pre-prosthetic treatment procedures, a new diagnostic cast was mounted on a semi-adjustable articulator (Articulator #3140; Whip Mix Corp) using an interocclusal centric record (Take 1, Kerr, Romulus, MI, USA) (Fig 2C) and a face bow (Artex Rotofix-Facebow; Girrbach Dental, Pforzheim, Germany) (Fig 2D).

Anterior guidance incorporating proper overjet and overbite essential to bring into effect a mutually protected occlusion was established after diagnostic waxing up maxillary and mandibular arches on the semi-adjustable articulator (Fig 3 A, B). Once anterior guidance was recorded, all temporary restorations after tooth preparations were prepared accordingly (Fig 3C), and the provisional crowns made from Heat-cured poly-methyl methacrylate acrylic resin (DPI, India) were refined and cemented with a block of temporary cement (Temp- Bond; Kerr Corp) (Fig 3D) followed by strict adherence to instructions. After cementation, an alginate impression (Jeltrate Alginate, Fast Set; Dentsply) was made, and the casts were remounted to check the accuracy of customized anterior guidance (Fig 3E). An interocclusal centric record was taken at this stage to verify the accuracy of the interocclusal record (Fig 3F). After preparing the wax patterns for each crown, they were cut back to fabricate the coping for metal and ceramic crowns (Fig 4A). All copings were tried in the patient’s mouth (Fig 4B) and then refitted on the articulator (Fig 4C). Porcelain was fired on all desired copings (Fig 4D), and after a porcelain trial, individual crowns were cemented in groups of anterior first and then posteriors (Fig 5A, B, C). Different types of cement were used depending upon the amount of tooth structure present to retain a crown. The patient was discharged after having received oral maintenance instructions. The patient was put on a follow-up, and during the first long-term follow-up of 1 year, the patient was extremely satisfied with the treatment outcome (Fig 5D).
Figure 3: (A) and (B) Wax up showing the occlusal scheme with canines guiding during eccentric movements (C) Provisional crowns showing the occlusal scheme (D) Provisional crowns in centric occlusion (E) and (F) Customizing anterior guidance table with various interocclusal records.

Figure 4: (A) Metal copings on working cast with individual dies (B) Metal trial with patient (C) Metal copings placed on dies (D) Porcelain fused to metal restorations.

Discussion

A young male adult patient seeking aesthetic rehabilitation for his AI condition has been described in this article. The main feature of this rehabilitation is the aesthetic outcome achieved through the use of metal and ceramic restorations that traditionally have been considered poor aesthetics due to the underlying metal substructure.[17] An important component of aesthetics in full mouth rehabilitation is the occlusal plane, which tends to attract more attention from a viewer if bilateral symmetry is not incorporated.[18] The restoration of the occlusal plane has been reported to be erroneously restored in many full mouth rehabilitations,[19] by not correcting the discrepancies found in the plane. Widely divergent views concerning the choice for occlusal schemes have led some rehabilitations to incorporate the existing occlusal plane without corrections. Alterations in the occlusal plane create restorative space problems and impair muscular function during eccentric movements.[20] Even if the natural anterior teeth have been destroyed excessively till the cervical third, the use of post cores in such cases allows one to correct the occlusal plane without impairing aesthetics. Cast post cores, the first restorative choice for grossly destroyed teeth, also allow clinicians to alter or incorporate minor changes in tooth inclination and overjet or overbite.[21] While the use of metal ceramics is limited by aesthetics, the use of all ceramics with existing technology is limited by connector size for fixed partial denture and strength. In terms of aesthetics, all-ceramic restorations have an advantage over metal and ceramic. However, when it comes to connector size,[22], the metal-ceramic fixed partial denture has minimum size with maximum strength.[23] This is especially important for treatments that look forward to lasting more than 10 or 15 years.

Among various clinical concerns for cases with AI, little light has been shed on the effect of the absence of enamel on the gingival architecture. This is especially important for clinical procedures like a gingival retraction. In addition, it has been mentioned that most clinicians find it difficult to capture the cervical finish lines despite using different methods and materials.[24] In full mouth rehabilitation cases, recording multiple preparation features is challenging and needs to be done with care. This is especially important if restorations are metal, or ceramic, for the marginal geometry is difficult to replicate in restorations due to the inherent disadvantages of metal shrinkage during casting. This holds for even all-ceramic restorations. As much as possible, one should try to give individual crowns to teeth affected by AI. If somewhere teeth are missing, a well fabricated fixed partial denture should be given, keeping Pontic aesthetics and tissue hygiene in mind.

Conclusion

Metal ceramic restorations can achieve good aesthetics in terms of shade, provided one manages to use the shade guide properly. However, the influence of underlying metal is minimized by the proper and adequate amount of tooth reduction, which is why intentional endodontic treatment should be done to minimize the development of over-contoured restorations.

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Conflict of Interest

There are no conflicts of interest to declare by any of the authors of this study.
References


