CASE REPORT

Prosthodontic rehabilitation of amelogenesis imperfecta in a young adult

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Abstract
Amelogenesis imperfect (AI) is a complex group of inherited conditions affecting the enamel in both primary and permanent dentitions causing psychological trauma from unaesthetic, worn teeth. A sequenced treatment is described for a young adult with AI with metal-ceramic restorations. The case describes a patient with AI having hypersensitivity, severely worn, and unaesthetic dentition. Authors treated the patient with full-mouth metal-ceramic restorations after achieving a functional and aesthetic occlusal plane using Broderick occlusal plane analyzer. A systematic treatment approach for the patient is described to achieve a long-term clinical success in the case of AI. The systematic treatment of AI as a full-mouth rehabilitation with endodontic therapy after establishing a proper occlusal plane provides long-term prognosis for the patient.

Keywords: Amelogenesis imperfect, enamel hypoplasia, full-mouth rehabilitation, hypersensitivity

Introduction
Amelogenesis imperfecta (AI) is a complex group of inherited conditions that disturb the developing enamel structure and exists independent of any related systemic disorder.\(^\text{[1-3]}\) This enamel anomaly affects both primary and permanent dentition. Dental features associated with AI include enamel deficiencies, pulpal calcification, taurodontism, root malformations, failed tooth eruption, impaction of permanent teeth, progressive root and crown resorption, congenitally missing teeth, and anterior and posterior open articulations.\(^\text{[4-6]}\) The primary clinical problems of AI are esthetics, dental hypersensitivity, and loss of occlusal vertical dimension. AI patients should be treated from a functional as well as psychosocial health standpoint. Historically, treatment of patients has included multiple extractions and fabrication of removable prostheses.\(^\text{[7,8]}\) These options are psychologically harsh when the problem must be addressed in adolescent patients. The treatment plan for patients with AI is related to many factors including the age of the patient, socioeconomic status of the patient, type and severity of disorder, and intraoral situation at the time, the treatment plan is developed. This clinical report describes sequenced treatment for a young patient with hypoplastic AI.

Case Report
A 22-year-old male patient came to the department of prosthodontics with a chief complaint of unaesthetic appearance and hypersensitivity of teeth (Figure 1a). On examination, he had severely worn dentition with only one-third of crown structure remaining in many teeth (Figure 1b). Upper lip was short in length. Radiographic examination showed retained left maxillary deciduous canine with an impacted permanent canine. Maxillary central incisors and mandibular central incisors and right lateral incisor showed endodontic treatment. The right mandibular first molar was missing. Family history showed that his elder brother was also affected by similar condition. Provisional diagnosis of AI was made.

A comprehensive examination was conducted, inclusive of a full-mouth periapical radiographic series, caries detection, and periodontal probing. The patient’s diagnostic casts were obtained and earbow (Teledyne Technologies, Los Angeles, California, USA) record was made. The casts were mounted on a semi-adjustable articulator (HanauH2; Teledyne Technologies, Los Angeles, California, USA) using centric interocclusal record obtained by bimanual technique.\(^\text{[9]}\) Due to considerable wear of all teeth, hypersensitivity, and compromised height of clinical crowns, full-mouth endodontic treatment along with crown lengthening surgery was carried out for all remaining teeth to increase clinical crown height and thereby enhance the long-term prognosis. Maxillary left first molar showed poor prognosis so it was extracted. Due to the severe attrition of teeth, occlusal plane was disturbed to a great extent. The Broderick’s occlusal plane analyzer was used to identify the most likely position of the center of the curve of Spee and redesign curves of Spee and
Wilson as well as orientation of the occlusal plane.[10-11] Anterior maxillary and mandibular diagnostic wax-up was completed and baseplate wax block (Modelling Wax; Deepti Dental Products, Ratnagiri, India) was placed on mandibular posterior teeth. To determine the occlusal plane of posterior teeth, Broderick flag was attached to upper member of the articulator after removing the maxillary diagnostic cast from the articulator. An arc of 4 inches radius was scribed on the Broderick flag using a marking pen attached to a compass with its tip on the distoocclusal edge of the left mandibular canine (anterior survey point).[10] As the left second mandibular molar was severely attrited, the most anterior point on the condylar element on the articulator was taken as a posterior survey point and a similar arc of 4 inches, intersecting the previous arc, was scribed.[10,14,15] The marking pen from compass was replaced by a sharp Bard-Parker blade of no. 15. Then, by keeping the point of compass on point of intersection of the two arcs, an arc was drawn on buccal surface of the mandibular left posterior teeth by cutting the wax block to get a definitive occlusal plane (Figure 2a). Same procedure was followed on the right side. Modelling Wax occlusal plane indices were made on the occlusal plane obtained by the wax blocks on mandibular posterior teeth and mounted on the upper member of the articulator (Figure 2b). The wax blocks from the mandibular posterior teeth were removed and posterior diagnostic wax-up was completed using the mounted Modelling Wax occlusal plane index. Finally, wax-up of maxillary posterior teeth was accomplished using the mandibular wax-up. Anterior guidance and canine-protected occlusion were achieved in the diagnostic wax-up. Four vinyl polysiloxane putty (Elite HD+, Zhermack SpA, Badia Polesin, Italy) templates were made of the maxillary and mandibular wax-up corresponding to each quadrant to allow duplication of the occlusal anatomy from the wax-up to prepare provisional restorations. Core build-up with composite resin was completed to increase the clinical crown heights and teeth were prepared. Provisional restorations (Luxatemp Star, DMG, Hamburg, Germany) were fabricated using the putty templates and evaluated for esthetics, phonetics, proper anterior guidance, and canine-protected occlusion of maxillary and mandibular provisional restorations. Irreversible hydrocolloid impressions (Neocolloid, Zhermack SpA, Badia Polesin, Italy) of the provisional restorations were made and the casts were mounted using earbow and interocclusal records of the provisionals against each other. A custom incisal guide table was fabricated. Vinyl polysiloxane putty index was made from the provisional models to duplicate the exact length and shape to fabricate the permanent restorations. The patient was recalled time to time to check the tolerance to the restored occlusal vertical dimension by the provisional restorations. Periodic evaluation was conducted for 3 months to check proper function, esthetics, and temporomandibular joint function. After complete satisfaction of the patient, appointment was planned to prepare definitive restorations. First, only the maxillary and mandibular anterior provisional restorations were removed keeping the posterior restorations intact. Anterior teeth preparations were modified and polished using pumice. Then, interocclusal registration was made of the anterior preparations by dispensing vinyl polysiloxane interocclusal registration material (Exabite II NDS, GC America INC, Alsip, Illinois, USA) in between the anterior teeth. The left posterior provisionals were removed and teeth modified as deemed necessary keeping the provisionals on the right side intact. By keeping the right posterior provisionals and the anterior interocclusal registration record, interocclusal registration materials were injected into the space between the left posterior prepared teeth. Same procedure was repeated for the right posterior side interocclusal registration. Thus, quadrant-wise centric interocclusal registration records were obtained maintaining the occlusal vertical dimension achieved with the provisional restorations. Definitive impressions of the prepared teeth were made using vinyl polysiloxane impression material (Elite HD+ light body and putty, Zhermack SpA, Badia Polesin, Italy). Ear-bow record was made and definitive casts were mounted on the semi-adjustable articulator using the centric occlusion records. Wax patterns were competed with the help of putty index of provisional casts and metal copings (Degudent LS, Dentsply International, York, PA, USA) were prepared from coping patterns obtained by cutback technique.[16] Metal copings were tried in the patient’s mouth for proper margin adaptation. Ceramic veneering (Ceramco 3; Dentsply Ceramco, York, PA, USA) was completed on the metal copings using putty index of the provisional restorations as a guide. Three unit fixed dental prostheses were fabricated with maxillary left first molar and mandibular right first molar. Rest of the restorations were individual crowns for each tooth. The unglazed metal-ceramic restorations were cemented using temporary cement (TempoCem Ne, DMG, Hamburg, Germany), and occlusal equilibration was carried out to achieve canine protected occlusion as in the provisional restorations. The patient was given necessary instructions about the temporary cementation and sent home so as to check final evaluation of the restorations for 24 h. After satisfactory outcome, the restorations were removed from the mouth and glazed for permanent cementation (Figure 3a and b). The patient was given oral as well as written instructions about proper maintenance of oral hygiene and recalled after 7 days, 1 month, and 6 months. The patient was satisfied with the esthetic and functional outcome of the treatment after 1-year follow-up.

Discussion

The treatment of AI is often a complex procedure involving multiple extractions, endodontic treatment, and orthodontic extrusion and/or crown lengthening procedure. The complete mouth rehabilitation by using fixed dental prostheses (Crowns & Bridges) is a conservative procedure as compared to the total extraction of remaining natural teeth and placement of removable dental prostheses or implant supported removable or fixed prostheses.[17] The patient described in the article had severe attrition of all teeth to the extent that only one-third crown structures were leftover several teeth. Considering the age of patient, it was
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necessary to provide a treatment that will enhance the esthetics and help relieve from the psychosocial trauma of severely worn, unaesthetic dentition. Full-mouth endodontic treatment was carried out to manage the hypersensitivity, for adequate tooth preparation and to prevent further consequences if any, after completion of the treatment. Crown lengthening procedure was performed on maxillary anterior teeth to increase the clinical crown heights of severely worn teeth. The upper lip was short in length so there was considerable show of the maxillary gingivae after the placement of definitive restorations. The patient was advised lip exercise to increase lip length to some extent. The patient was instructed to maintain meticulous oral hygiene since caries of abutments is the leading complication of fixed dental prostheses supported by the natural dentition.

The radiograph of the patient showed impacted maxillary left canine which was considerably superior to the apices of adjacent teeth. Although surgical-orthodontic extrusion of the impacted canine is a treatment option, the permanent impacted canine in the case was underdeveloped and high in maxilla, so the orthodontists opined against orthodontic extrusion. Furthermore, deciduous maxillary canine was firm and having sufficient crown structure, so it was decided to retain it instead of its extraction. However, future resorption of the roots of the deciduous canine can be a possible complication.

AI is a disorder of enamel causing severe attrition and hypoplasia of teeth. The patients suffer not only from the unaesthetic worn out dentition but also from severe hypersensitivity due to loss of enamel and dentine exposure. Long-term prognosis of these patients can be achieved by a multidisciplinary treatment involving endodontic therapy, crown lengthening, orthodontic procedures, and protection of the remaining teeth by definitive restorations. The collapsed occlusion due to severe attrition of teeth must be restored at a harmonious vertical dimension through provisional restorations which must be evaluated for several days or weeks to adapt at the altered vertical dimension. This achieved vertical relation should be duplicated in the definitive restorations to avoid occlusal and temporomandibular abnormalities.

Conclusion

Amelogenesis imperfecta is a disorder of enamel causing severe attrition and hypoplasia of teeth. The patients suffer not only from the unaesthetic worn out dentition but also from severe hypersensitivity due to loss of enamel and dentine exposure. Long term prognosis of these patients can be achieved by a multidisciplinary treatment involving endodontic therapy, crown lengthening, orthodontic procedures and protection of the remaining teeth by definitive restorations. The collapsed bite due to severe attrition of teeth must be restored at a harmonious vertical dimension through provisional restorations which must be evaluated for several days or weeks to adapt at the altered vertical dimension. This achieved vertical relation should be duplicated in the definitive restorations to avoid occlusal and temporomandibular abnormalities.

References

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