Prosthetic and Surgical Approach for Oral Rehabilitation in a Patient with Amelogenesis Imperfecta: A Clinical Report

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Abstract:
Amelogenesis imperfecta is a heterogeneous group of hereditary disorders. Its treatment continues throughout the patients’ childhood and adolescence and consists of advanced restorative care in severe cases. A thorough prosthodontic treatment plan including orthognatic surgery, full veneer crowns and all ceramic anterior crowns is presented in this clinical report.

Key Words: Amelogenesis; Treatment; Prostho-Surgery

INTRODUCTION
Amelogenesis imperfecta (AI) encompasses a heterogeneous group of developmental disorders that demonstrate alterations in the enamel [1]. It is characterized by clinical and genetic heterogeneity in the absence of systemic abnormalities or diseases [1,2]. AI is caused by mutations in genes that control amelogenesis and follows inheritance patterns of autosomal-dominant, autosomal recessive or X-linked modes of transmission [1-3]. There are also patients for whom a family history cannot be identified but where a mutation is present. An ideal classification of AI has not yet been established [3]. The enamel defects of AI are clinically divided into hypomineralized and hypoplastic forms. Hypomineralized types range from milder forms of hypomaturity to severe hypocalcifications [4]. Both primary and permanent dentitions are usually affected and varying degrees of taurodontism is seen in some types of AI. An association between AI and skeletal anterior open-bite has also been reported but the cause for their simultaneous occurrence has not been found [5,6]. Clinical problems of AI patients mainly include poor esthetics, sensitivity of teeth, chewing difficulties and loss of tooth substance due to chipping and attrition. Treatment starts from childhood and continues throughout adolescence. Advanced restorative care may be the only solution in severe cases [6,7].

CASE REPORT
A 21-year-old female patient was admitted to the Department of Prosthodontics (post graduate program), School of Dentistry, Shahid Beheshti University of Medical Sciences, for evaluation and treatment of esthetic and intraoral dysfunctions (Fig.1A). Her chief complaint was upper and lower
A            B      C      D

Fig. 1: Patient’s smile before treatment demonstrating unfavorable color and alignment of teeth (A); Intraoral view of the occlusal surfaces of the upper (B) and lower (C) jaws demonstrating severe attrition. D: Lateral cephalogram of patient.

posterior teeth wear along with masticatory inefficiency (Fig.1B&C). Hypocalcified enamel, hypomature teeth, and brown patches were observed during initial inspection and a diagnosis of amelogenesis imperfecta type IV was rendered. Further examination revealed anterior open bite with severe attrition of all upper and lower posterior teeth. A deep nasolabial angle and bimaxillary protrusion was noticed during frontal and profile inspection. An increased mandibular tooth display was observed during smiling, especially when compared with age, sex and racial standards. The patient had an asymmetric smile and lateral negative spaces were absent. Her medical history was unremarkable and the head, neck and shoulder muscles were not painful.

Cephalometric analysis showed skeletal open-bite in addition to a short midface and maxilla (Fig.1D). Maximum mouth opening was 43 mm. Examination of maxillo-mandibular relative position showed coincidental centric and occlusal relations and a unilateral balanced occlusion (group function). Deflection to the left and limitation of movement toward the right was observed upon opening. Bilateral clicking was also audible on mouth opening, especially in the left side. Temporomandibular joints were not painful during the required movements.

Both right and left upper third molars were missing and the lower right second premolar was either extracted or missing. All anterior teeth demonstrated opaque enamel with a yellowish-brown color. Despite the patient’s compliance and good oral hygiene, excessive calculus was observed on the molars because of severe attrition and loss of their self-cleansing property. Considering the esthetic and functional demands of the patient we were facing a dilemma: lack of adequate posterior interocclusal space for reconstruction, and correction of the anterior open bite. Orthodontic treatment was not possible because the space for bands or brackets was not enough. The diagnostic casts were analyzed and the occlusal space required for the replacement of posterior teeth was assessed. Accordingly, a minimum of 2.5 mm crown-lengthening was suggested for each of the posterior teeth, which would probably lead to furcation involvement. Regarding the age of the patient, necessary longevity of the treatment, and patient demand to correct the anterior open
bite, periodontal surgery was ruled out as a treatment option. Occlusal attrition of the posterior teeth was corrected with diagnostic wax which caused an increase in the open bite, to a larger amount than its previous state (Fig. 2). In order to correct the posterior attrition and simultaneously close the anterior open bite, the final treatment plan involved upward movement of the posterior segments of the maxillae and rotation and downward movement of the upper anterior segment. This was achieved through prosthetic work-up prior to orthognatic surgery. Provisional full metal crowns were used for restoring the maxillary and mandibular posterior teeth to their final contour, leading to exacerbation of the anterior open bite and an increase in vertical dimension (Fig. 3A & B). The open bite and vertical dimension were to be corrected by surgery. Therefore in addition to restoring the open bite, the metal crowns could provide an orthopedic stabilizer through their intercuspation and also act as a guide for the surgeon when restoring the normal vertical dimension. Preparation of posterior teeth was limited to the proximal and axial surfaces and was not necessary on the occlusal surfaces due to their severe attrition. Acrylic temporary crowns were fabricated to protect the preparations. In order to prevent patient discomfort during laboratory procedures, a hole was made in the occlusal surfaces of the temporary crowns so that vertical dimensions would not be increased. Final impression of the posterior prepared teeth was taken to construct the provisional metal crowns. The upper and lower master casts were mounted in centric relation on an articulator using a face-bow transfer. The posterior occlusal clearance was estimated at 4mm and the vertical dimension on the articulator was increased accordingly, by augmentation to approximately 3mm in the lower premolar region. Consequently the incisal pin on the articulator lost its central location on the incisal table. Full contour wax patterns were fabricated on all prepared posterior teeth at the increased vertical dimension. Afterwards the posterior segment of the maxillary master cast carrying the wax patterns was separated and its base was trimmed so that the separated
segment could be moved upward. This trimming and upward positioning was tried several times until the incisal pin regained its central position on the incisal table. In this manner the vertical dimension would remain unchanged till the end of surgery. No preparation was done on the upper and lower left first premolars so that they could act as an intraoral incisal pin and verify and stabilize the vertical dimension during surgical procedures. These teeth were to be extracted at the end of surgery. Finally, when the maxillary posterior segment reached the desired level, it was refixed to the maxillary master cast with plaster, and the intercuspatation of the upper and lower wax patterns was optimized. Intercuspatation on the final full metal crowns is necessary to guide the surgeon in repositioning the posterior segments.

Rotation and downward movement of the premaxilla was anticipated in the initial treatment plan. According to esthetic analysis, successful treatment of the oprenbite could not be achieved by merely operating on the premaxilla. Thus an upward movement of the anterior segment of the mandible was also necessary. Therefore the anterior segment of the maxilla was separated from the master cast and re-fixed with plaster after downward movement. This was followed by separation of the anterior lower segment, its upward movement to the desired position and re-fixing it to the mandibular master cast. Finally all posterior wax patterns were cast into full metal crowns. An acrylic splint was made to reorient the maxillary and mandibular anterior segments into the desired relation during surgery. This treatment sequence was followed throughout surgery. The full metal posterior crowns were cemented into place prior to surgical procedures and the segmented osteotomies were positioned into the desired locations as guided by the crowns and acrylic splint. Surgery was completed by intermaxillary fixation.

The intermaxillary fixations were opened after complete tissue healing and a prosthetic full-mouth reconstruction was planned and carried out (Fig. 4). Since the mandibular anterior teeth did not show severe discoloration, it was decided to improve their shade by bleaching. In contrary, In-ceram crowns were used to correct the form and shade of the maxillary anterior teeth. The anterior guidance was setup through the temporary crowns and incisal table of the articulator.

The posterior full metal provisional crowns were removed and the preparations modified to receive metal ceramic crowns. After try-in of the porcelain fused to metal crowns, occlusion was adjusted intraorally to assure exclusion of posterior teeth through all protrusive and lateral movements. Mutually protected and unilateral balanced occlusions were designed and successfully accomplished (Fig. 5A & B).

REFERENCES
