

Interdisciplinary treatment for a patient with open-bite malocclusion and amelogenesis imperfecta

Adilson Luiz Ramos,^a Renata Corrêa Pascotto,^b Liogi Iwaki Filho,^c Roberto M. Hayacibara,^d
and Guilherme Boselli^e
Maringá, Brazil

Amelogenesis imperfecta (AI) comprises a clinically and genetically heterogeneous group of conditions that affect the dental enamel, occasionally in conjunction with other dental, oral, and extraoral tissues. The aim of this case report is to describe an interdisciplinary treatment of hypoplastic AI associated with a severe open bite. The treatment consisted of surgical, orthodontic, periodontal, prosthetic and restorative management, establishing good chewing function, dental esthetics and facial harmony. (*Am J Orthod Dentofacial Orthop* 2011;139:S145-53)

Amelogenesis imperfecta (AI) represents a group of conditions that affect the structure and clinical appearance of the enamel of all or nearly all the teeth; it might also be associated with morphological or biochemical changes elsewhere in the body.¹⁻³ The incidence of AI varies from 1 in 700 to 1 in 14,000 people, depending on the population studied and the diagnostic criteria used.^{1,4,5} Oral complications associated with AI include tooth sensitivity, poor dental esthetics, and decreased vertical dimension.^{6,7}

Some published surveys report the importance of treating the AI patient not only from a functional standpoint but also from a psychosocial standpoint.^{8,9} Results of the survey found that patients with AI experience higher levels of social avoidance combined with a perceived reduced quality of life compared with those without AI and that treatment has a positive psychosocial impact.⁹ The aim of this case report is to present a multidisciplinary approach to a patient with AI and a severe open bite.

DIAGNOSIS AND ETIOLOGY

A 15-year-old boy with an angle Class I malocclusion, anterior open bite, and narrow maxilla (with posterior bilateral crossbite), as well as a long face, was referred for orthodontic treatment (Figs 1 and 2). The patient was dissatisfied with the discoloration of his teeth, which was caused by hypoplastic AI.

TREATMENT OBJECTIVES

After clinical and radiograph evaluation (Figs 2 and 3) it was decided that orthognathic surgery would be necessary to accomplish both orthodontic and facial goals, and the need for a dental restorative approach was also evident.

TREATMENT ALTERNATIVES

The first orthodontic treatment alternative was edge-wise arch wire therapy and anterior intermaxillary elastics, preceded by maxillary expansion. The effects of this treatment would cause extrusion of anterior teeth, correcting malocclusion by vertical compensation of the skeletal problem. Because facial disharmony was the patient's complaint and the potential for significant relapse, this treatment option was not chosen.

The second treatment option was to use miniscrew or miniplate anchorage to intrude the posterior teeth in both arches, and to extrude the maxillary anterior teeth in order to close the anterior open bite. However, facial improvement could not be predicted accurately, and the potential change was not considered adequate enough with this treatment. Furthermore, the potential

^aAdjunct Professor, Universidade Estadual de Maringá, Paraná, Brazil.

^bAssociate Professor, Universidade Estadual de Maringá, Paraná, Brazil.

^cAssociate Professor, Universidade Estadual de Maringá, Paraná, Brazil.

^dAssistant Professor, Universidade Estadual de Maringá, Paraná, Brazil.

^ePrivate practice, Maringá, Brazil.

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Reprint requests to: Adilson Luiz Ramos, Arthur Thomas 831, Maringá - PR Brazil, 87013-250; e-mail, alramos@uem.br.

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Fig 1. Pretreatment photographs.

for relapse would be significant, so this treatment was also discarded.

The third alternative, and that which was chosen, involved mandibular and maxillary surgery combined with orthodontic treatment. This plan involved maxillary forward positioning and mandibular forward counterclockwise rotation along with a genioplasty. This treatment option could improve facial retrusion and correct the malocclusion with more predictability, as well as overcome the patient's chief complaints.

Whichever orthodontic treatment was chosen, extensive restorative dentistry would be necessary after orthodontic treatment.

TREATMENT PROGRESS

Since the patient was still growing, treatment was delayed until facial growth was completed. Thus, the

orthognathic surgery would be performed after puberty. During this interval, the patient underwent a rhinoplasty procedure, to improve nasal contour (Fig 4). Prior to orthodontic treatment, the patient did not show a sufficient amount of his maxillary incisors. In addition, he had large buccal corridors when smiling and the tooth color was compromised by the AI. The facial proportions showed a vertical excess, and the lateral profile photograph revealed both maxillary and mandibular retrusion.

Orthodontic preparation involved maxillary arch expansion (Hyrax expander followed by transpalatal bar), as well as alignment and leveling, in order to achieve better arch coordination prior to orthognathic surgery.

Despite the enamel dysplasia, no bracket/bond failures were observed during treatment. Conventional

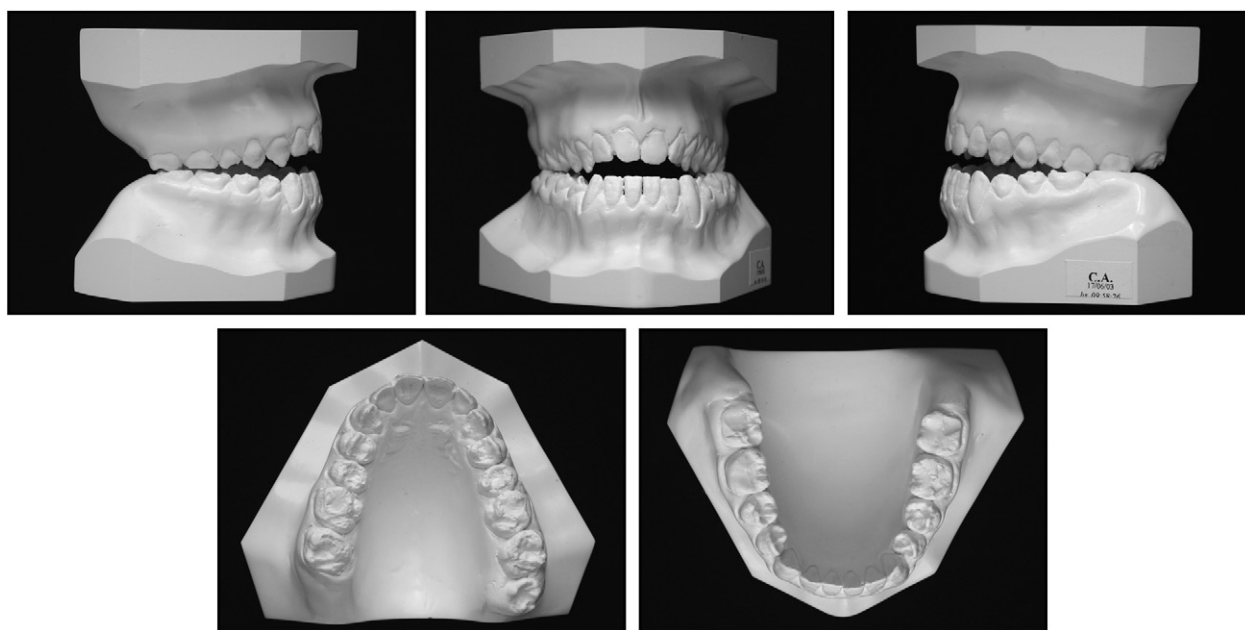


Fig 2. Pretreatment dental casts.

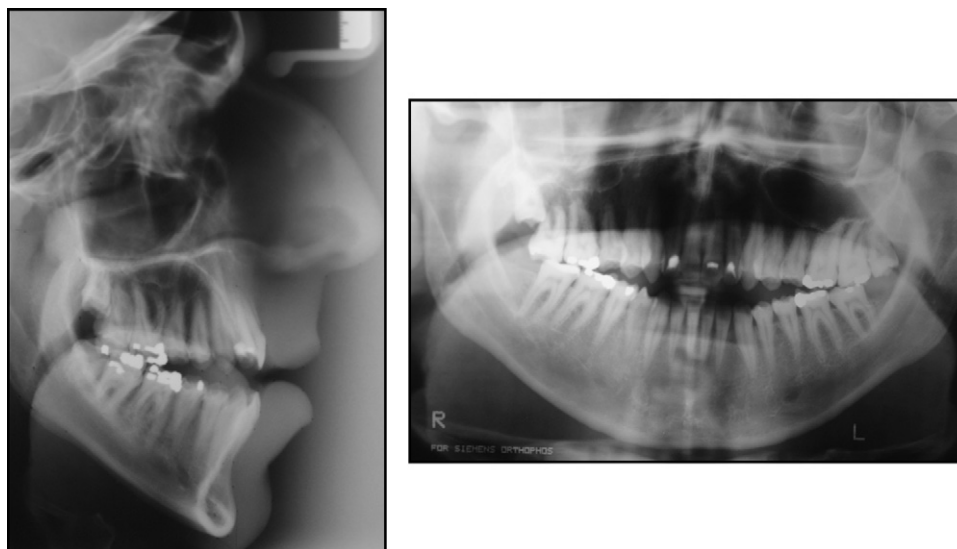


Fig 3. Pretreatment cephalometric radiograph and pantomograph.

enamel conditioning and bonding procedures were used (37% phosphoric acid for 30 seconds followed by rinsing and drying and the use of Rely-a-Bond adhesive (Reliance Orthodontic Products, Inc, Itasca, Ill).

After 14 months of preoperative orthodontics, hooks were attached to both arch wires (Fig 5). Orthognathic surgery was performed and the maxilla and mandible

were moved forward. The mandible was rotated in a counterclockwise direction and a genioplasty was also performed (pre- and postoperative radiographs shown in Fig 6). After 3 months of healing, the finishing phase of orthodontic treatment was accomplished (Figs 7 and 8). The overall orthodontic treatment time was 29 months.

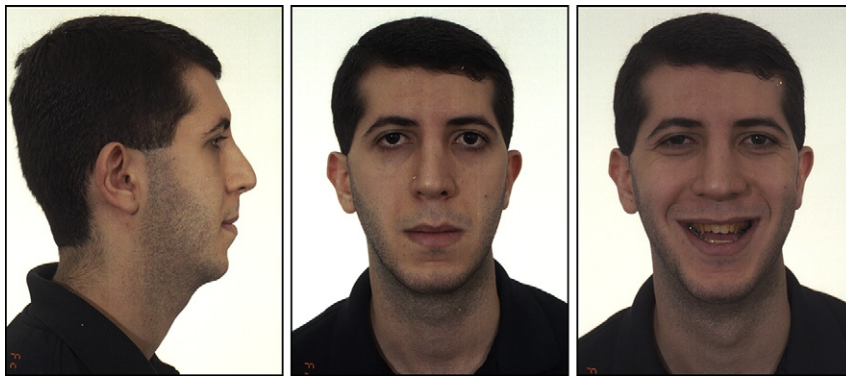


Fig 4. Extraoral photographs after rhinoplasty, just before orthodontic treatment.



Fig 5. Preoperative intraoral photographs.

RESULTS

After orthodontic treatment was complete, the maxillary anterior teeth (canine-to-canine) were restored with ceramic IPS Empress laminate veneers (Ivoclar Vivadent, Principality of Liechtenstein) (Fig 9). All other teeth were reconstructed with composite resin (Filtek Z250, 3M ESPE Dental Products, St. Paul, Minn) on both buccal and occlusal surfaces. These materials were selected based on the desire to keep the restorations conservative. The restorations improved the buccal corridors, enhanced the anterior arch curvature relative to the lower lip, and improved tooth form and color.

During the restorative procedures, the gingival recession labial to the maxillary right first premolar was successfully treated with a root coverage gingival graft (Fig 10). This interdisciplinary approach improved both the facial and dental aspects and also improved the patient's self-esteem (Figs 11 and 12).

DISCUSSION

This case report describes the interdisciplinary treatment of a patient with AI and a severe open-bite malocclusion. The AI affects both the primary and permanent dentitions, and exists independent of any related

systemic disorder.^{2,3} The AI phenotypes vary widely depending on the specific gene involved, the location and type of mutation, and the corresponding putative change at the protein level.⁴ Different mutations in genes that transcribe principal matrix proteins and proteinases of enamel have been associated with different phenotypes of AI.^{10,11}

Many systems of classification have been proposed for the different AI types.^{1,3,5,12,13} Aldred and Crawford assumed that phenotypes of AI are found both within families and within different teeth of the same person, suggesting that a classification based primarily on phenotype is unsatisfactory.^{5,12} They proposed a new classification that would include not only phenotype but also the molecular basis, biochemical outcomes, and mode of inheritance of AI.¹² Although classification based on genotype may be ideal, only the X-linked forms have been characterized as to molecular defect, making molecular-based classification unrealistic at present. The molecular defects of AI will be established presently; however, clinicians must generally rely on clinical and radiographic findings when diagnosing and planning treatment for patients with AI.

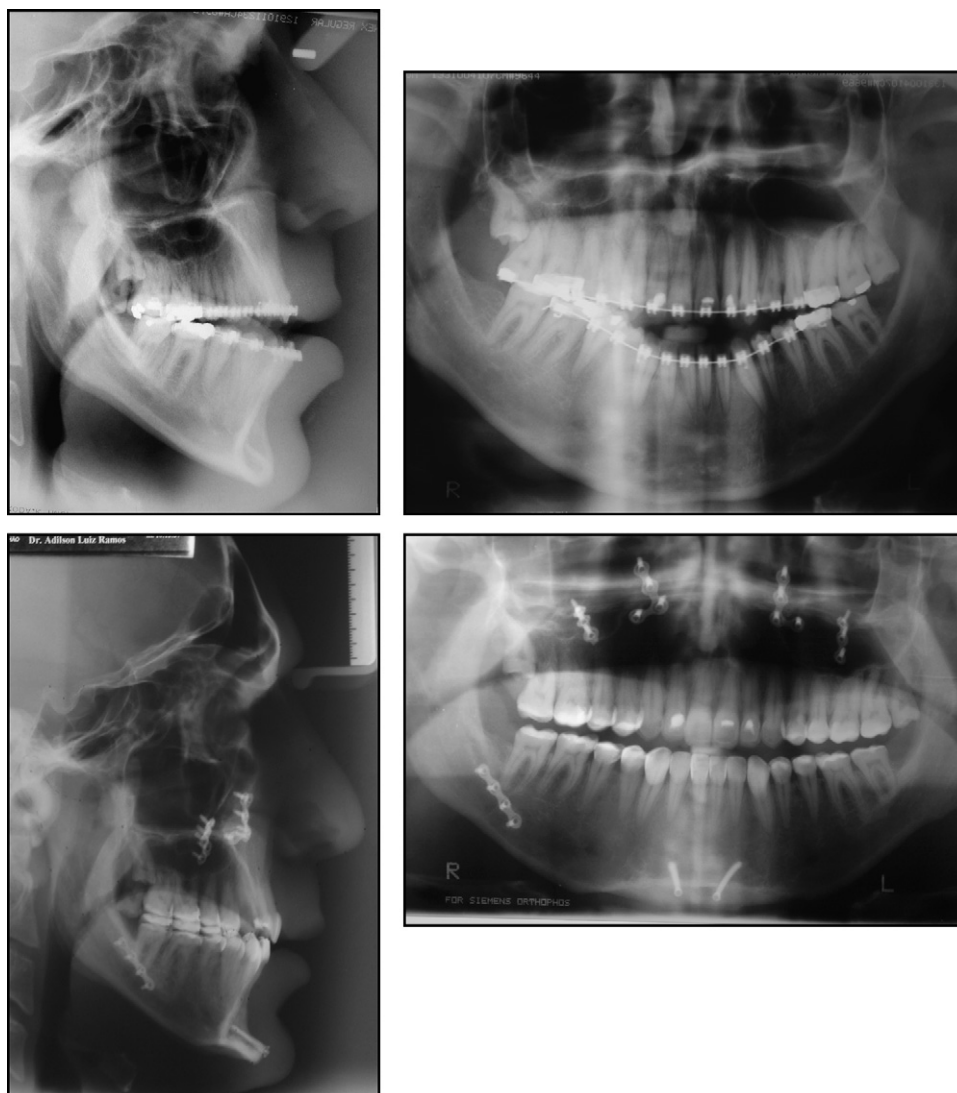


Fig 6. Pre- and postoperative radiographs.

The system proposed by Witkop¹³ in 1988, which presents 4 AI types (hypoplastic, hypocalcified, hypomaturation, and hypomaturation-hypoplastic) and 15 subtypes based primarily on the phenotype and secondarily on mode of inheritance, is currently the system most frequently cited.

Prevalence of open bite among patients with AI ranges from 24% to 60%.^{14,15} In the United Kingdom, 44% of individuals with AI had “vertical dysgnathia,” defined as a maxillary to mandibular plane angle greater than 34° based on cephalometric analysis. Of this “vertical dysgnathia” group, approximately half had an anterior dental open bite.¹⁵ Other skeletal and dentoalveolar features include posterior maxillary

vertical hyperplasia an accentuated maxillary but reversed mandibular curve of Spee, a high palatal vault, and a maxillary dental arch transverse discrepancy.¹⁴⁻¹⁷

The skeletal anterior open bite can involve excessive alveolar vertical development, a short mandibular ramus, a high mandible plane angle, and excessive anterior facial height and is frequently associated with the absence of passive lip competency.^{18,19} Many orthopedic-orthodontic methods have been used to correct open bite (high-pull head gear, bite blocks with or without magnets, intrusion appliances, and other variations).¹⁸ However, in adults the majority of open-bite cases need orthognathic surgery for effective correction.^{15,16} Recently, skeletal anchorage systems have



Fig 7. Intraoral photographs 3 months after orthognathic surgery.

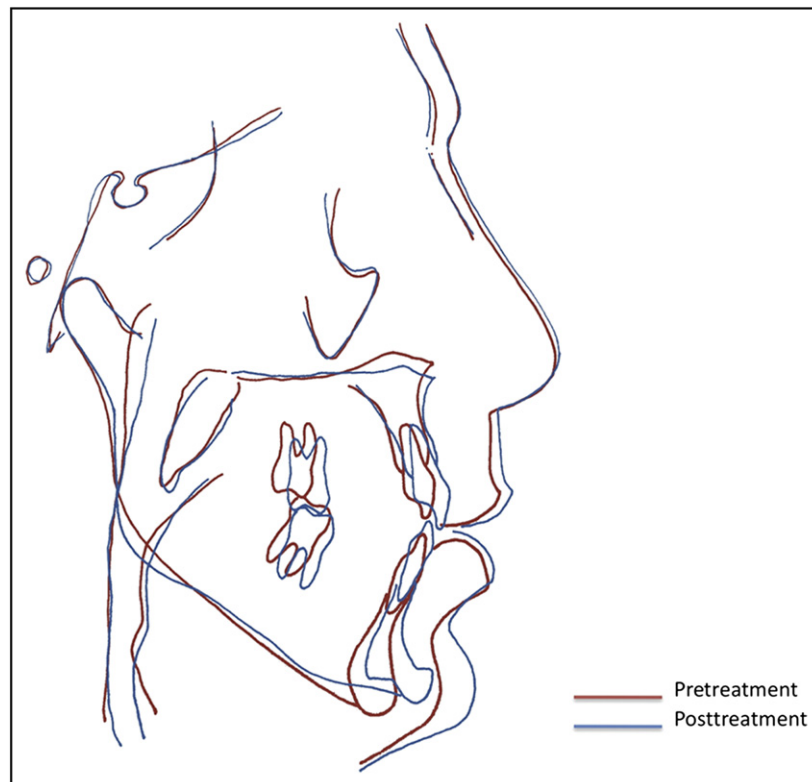


Fig 8. Overall superimposition of pre- and posttreatment cephalograms.

been used in moderate to severe cases, with promising results,¹⁸⁻²⁰ however some long-term relapse can be expected.²¹

Although the patient had lower anterior vertical excess, the maxillary incisors were not visible at rest, and both the maxilla and mandible were in a position of retrusion. Therefore, as the maxilla was moved forward, the lower facial height could be corrected by vertical reduction genioplasty along with the counterclockwise repositioning of the mandible.

The surgical treatment of adult patients with open bite and AI should produce an adequate intermaxillary

relationship to facilitate occlusal rehabilitation. Restorations are usually necessary to decrease the risk of damage to the pulp and to restore the anatomy of the crowns. The general aim of the treatment for this patient was to improve chewing function, dental esthetics, and facial harmony. This required an interdisciplinary treatment.^{15,16,22}

In this patient, anterior ceramic veneers were used to reestablish incisal and canine guidance. Direct composite resin was applied to the other teeth to obtain contour and correct the occlusal and interproximal contacts with adjacent and antagonist teeth. To preserve sound dental



Fig 9. Maxillary anterior laminate veneers.



Fig 10. Maxillary first premolar gingival recession before and after root coverage graft.

structure, the anatomical form of posterior teeth was re-established with direct composite, using a bonding material as an interim restoration. In the future, the direct composite restorations could be replaced by ceramic crowns. Photographs taken 3 years after treatment show good stability of both the orthodontic and restorative procedures (Fig 13).

CONCLUSIONS

AI comprises a clinically and genetically heterogeneous group of conditions that affect the dental enamel, occasionally in conjunction with other dental, oral and extraoral tissues. The aim of this case report was to describe an interdisciplinary approach to the treatment of hypoplastic AI associated with a severe anterior open-bite deformity.

In conclusion, the patient's functional and esthetic expectations were successfully achieved with a long list of interdisciplinary procedures, which included orthodontic treatment, rhinoplasty, orthognathic surgery,

gingival grafting, porcelain laminate veneers, and direct composite restorations.

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Fig 11. Posttreatment photographs.

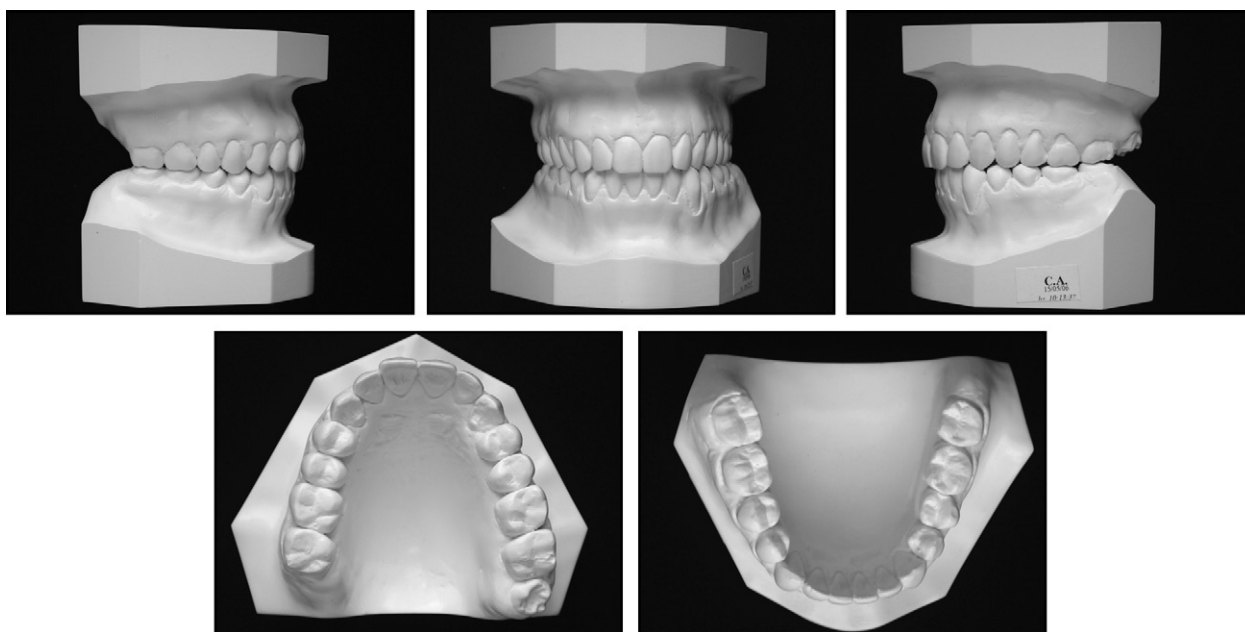


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Fig 13. Three-year follow-up photographs.

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