



Treatment of teeth in the esthetic zone in a patient with *amelogenesis imperfecta* using composite veneers and the clear matrix technique: A case report

Zbrinjavanje zuba u estetskoj zoni kod pacijenta sa *amelogenesis imperfecta* primenom kompozitnih faseta i matriks tehnike

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Abstract

Introduction. Restorative dental treatment of patients with a generalized form of *amelogenesis imperfecta* (AI) remains a challenge even today. The treatment approach is multidisciplinary and includes action of several dental disciplines such as restorative, orthodontic, and prosthetic dental specialties. **Case report.** A 18-year-old female patient was referred to the Department of Restorative Dentistry and Periodontology at the Military Medical Academy of Belgrade, Serbia. She was diagnosed with AI and formerly had been treated for a long period of time at the Department of Pediatric Dentistry and Orthodontics. Her primary concern upon arrival was discomfort and concern for the esthetic appearance of the anterior teeth. The treatment was done with the modified clear matrix technique used in composite veneer restoration of teeth in the esthetic zone. **Conclusion.** Because fixed prosthetic restoration with crowns, is the final treatment of AI patients it involves severe tooth structure loss. The clear matrix method which was done in this case allowed for greater comfort, functionality, simplicity, speed, greater economic efficiency and tooth structure preservation.

Key words:
amelogenesis imperfecta; esthetics, dental; dental veneers; dental materials; treatment outcome.

Apstrakt

Uvod. Restorativno lečenje zuba kod osoba sa opštom *amelogenesis imperfecta* (AI) i danas predstavlja problem. Terapijski pristup je multidisciplinarni i uključuje nekoliko specijalista iz oblasti stomatologije, kao što su restorativna stomatologija, ortodoncija i protetika. **Prikaz bolesnika.** Ženska osoba, stara 18 godina, primljena je na Odeljenje konzervativne stomatologije i parodontologije Vojnomedicinske akademije u Beogradu. Ona je obolela od AI, a pre toga je bila dugogodišnji pacijent na Odeljenju dečje stomatologije i ortodoncije. Njen primarni razlog posete bio je nelagodnost i zabrinutost zbog izgleda svojih zuba, naročito u zoni osmeha. Lečenje je sprovedeno korišćenjem kompozitnih vinira i modifikovanom *clear matrix* tehnikom. **Zaključak.** S obzirom na to da protetsko zbrinjavanje kao finalno rešenje kod osoba sa AI podrazumeva brušenje velikog broja zuba, modifikovana *clear matrix* metoda koja je primenjena u ovom slučaju je znatno komfornija, funkcionalnija, jednostavnija, brža, ekonomski prihvatljivija, a omogućava očuvanje zubnih struktura.

Ključne reči:
amelogenesis imperfecta; estetika, stomatološka; fasete, zubne; stomatološki materijali; lečenje, ishod.

Introduction

Amelogenesis imperfecta (AI) belongs to a group of hereditary syndromes that affect enamel formation during tooth development and create a functional and esthetic problem for

both the patient and the dental professional. It generally affects all teeth, but it has been sometimes seen in a localized form where it affects only a portion of dentition. AI occurs 1 : 700 to 1 : 16,000 in a population depending on the analytic standards used^{1,2}. The transmission of this syndrome is

genetic and can be autosomal dominant, autosomal recessive, X-linked or irregular³. AI affects primary and secondary dentition. Patients with AI usually have the following symptoms: teeth hypersensitivity, abnormal enamel structure, reduced crown esthetics, reduced crown size, occlusal dimension pathology, delayed eruption, tooth impaction, gingival inflammation and taurodontism⁴⁻⁶.

In the literature it has been found that malformed enamel is closely related to lower or no production of enamelin, tuftelin, amelogenin and ameloblastin⁷. The appearance of teeth especially in the esthetic zone has a special psychological effect on a young adolescent patient. Parekh et al.⁸ reported that several psychological problems arise in children and adolescent patients diagnosed with AI, which they differentiate into two major psychological archetypes. They include personal dissatisfaction and fear from comments made by their peers that refer to their appearance. The patients in that study reported similar dissatisfaction with the appearance of their smile, which was equivalent to the amount of discontent they had with the functionality aspect of their dentition. Therefore, it can be inferred that AI has a major influence on the patient's everyday life both esthetically and functionally.

The classification of AI divides the syndrome into four basic phenotypic types: hypomaturation, hypoplastic, hypocalcified and hypomaturation-hypoplastic types⁹. However, it is known today that there are 14 subtypes of AI¹⁰. In this case study the patient's teeth had an opaque mottled appearance with light brown to yellow discoloration of frontal teeth and darker brown to black discolorations of posterior teeth. Concerning posterior teeth in both the maxillary and mandibular arches, some of the enamel chipped in larger pieces of the occlusal teeth surfaces and had been previously restored. This type of AI is a product of a faulty maturation phase in amelogenesis. Generally, the hypomaturation type has some of the following dental complications: increased caries incidence, impactions, open bite deformity and taurodontism¹¹.

With most AI patients it is important to correct the occlusion as much as possible with a proper orthodontic treatment, and reduce the number of carious teeth to a minimum with proper restorative and preventive dental care. The final

treatment in any case will be with fixed crowns and circular bridges in both arches. Today, with the advances in composite material technology, it is possible to esthetically restore teeth in patients with AI with composite veneers, which reduces cost, psychologically helps the patient carry on every day life and delays costly and invasive fixed prosthodontic treatment.

This case report focused on oral rehabilitation with composite materials in the 18-year-old patient with one of the hypomaturation subtypes of AI. The restoration included the novel type of treatment of the esthetic zone of the mouth – the modified clear matrix technique for composite veneers in the esthetic zone of both dental arches.

Case report

A female patient was referred to the Department of Restorative Dentistry and Periodontology at the Military Medical Academy of Belgrade. She was diagnosed with AI and was a long-term patient at the Departments of Pediatric Dentistry and Orthodontics. Her primary concern upon arrival at our office was discomfort and the appearance of teeth, particularly in the esthetic zone of smile.

Her medical history was exceptional as she negated any systemic medical problems. However, she did report a family history of similar conditions. During an oral examination it was noticed that the teeth had an opaque white color with light brown to yellow pigmentation that generated the mottled appearance of all tooth surfaces. The teeth had dark brown spots with black pigmentation on teeth 14, 24, and 33. The facial surfaces of the anterior teeth had white opaque enamel color with yellow vertical lines, which were sporadically situated. The diastema was not significantly present, except between teeth 11 and 12. Also, the tooth 12 was slightly rotated and the shape of the teeth in the esthetic zone generally did not stand out as irregular. Palatal surfaces of the frontal teeth did not have any anomalies except the opaque color and slight pigmentation (Figures 1 a and b).

The patient did not report increased sensitivity to cold (air blow test) or warm (warm gutta-percha test). The vertical dimension of occlusion was previously corrected through an orthodontic treatment and brought within class I occlusal po-

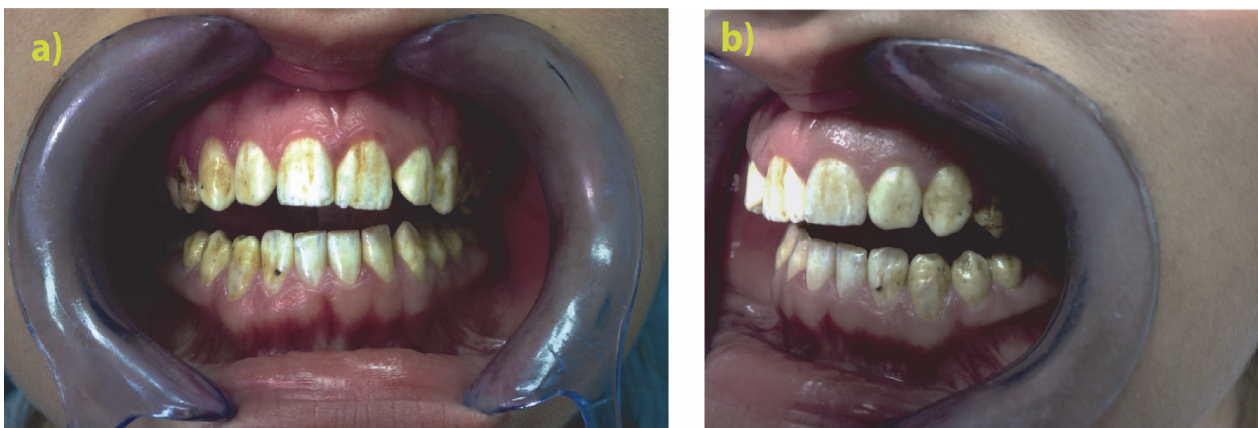


Fig. 1 – a) Anterior and b) side view of preoperative dental condition.

sition. The level of oral hygiene was satisfactory based on the levels of dental plaque index and gingival bleeding index. The gingiva was without any visible signs of inflammation and the rest of the oral mucosa was without any visual pathology. The patient negated any functional masticatory problems. All of the teeth present were previously restored with fillings and there were no carious teeth left. The classification of the main pathology, the AI, was done according to Witkop's classification. According to this classification it was found that the AI in question was type IIA, hypomaturation autosomal recessive form of AI¹⁰.

The treatment course was planned according to the needs and financial capabilities of the patient. It concerned primarily a low cost composite restoration of the facial surfaces of all teeth in the esthetic zone with as less visits as possible and as little chair time as possible. She desired the restoration in the whole esthetic zone to be finished in one session. After consultation it was decided that the treatment was to be done with the modified clear matrix technique used in composite veneer restoration of the esthetic zone. The dental team concluded that it is too early for fixed crowns, at least in the esthetic zone, and that it was necessary to prolong the beginning of the fixed prosthetic treatment of this patient. The treatment could include fabrication of ceramic veneers, but the cost was not satisfactory for the patient. In agreement with the patient it was decided that the best solution was to restore the facial aspects of the teeth in the esthetic zone with composite veneers.

Impressions were made with alginate (Neocolloid alginate, Zhermarck[®], Badia Polesine, Italy), and alabaster cast models were fabricated (Alabaster, PoliDent[®], Volcja Draga, Slovenia). The facial aspects of all the predetermined teeth on the cast model in the smile area were slightly prepared with fine conical dental bur and a wax up of the future veneers was modeled with light-curing dental wax (LC Block-Out Resin, Ultradent[®], South Jordan, USA). We decided to utilize this type of wax because of its easy manipulation, consistency and durability, which was needed during the thermo-vacuum transparent plate fabrication. The transparent splint plate (Duran[®], Scheu, Iserlohn, Germany) was fabricated on the wax-up cast model and each tooth on the splint was separated with a disk burr (Galaxy[®] Cutting Wheel, Ortho Technology, Tampa, Florida, USA) so that each separated piece matched one tooth in the mouth.

The tooth facial surfaces were minimally prepared so that the proper roughness of the facial tooth surface was achieved first with a flame rough black ring 18 µm diamond burr (Diamond bur, New Tecnology Instruments NTI[®], Thuringia, Germany) and then with a finer modified beveled cylinder yellow ring diamond 20 µm bur. After the proper roughness was achieved, retention slots were made parallel to the axial line of the tooth, which were 0.5 to 0.6 mm in depth for the frontal, and posterior teeth respectively. Therefore, for molars and the premolars, the thickness of the diamond bur used was 1.2 mm and for the frontal teeth it was 1.0 mm. The slot depth was determined by achieving depth of half of the thickness of the dental bur.

Upon the completion of the facial surface preparation, rubber dam – OptraDam (OptraDam[®] Plus Medium, IvoclarVivadent Corporate, Schaan, Liechtenstein) was positioned with a proper clamp (Rubber Dam Clamp, Dentsply[®], Islandia, NY USA), one tooth at a time, with the inner plastic ring removed from the rubber dam. It was decided on a two-step bonding system. With the clamp and rubber dam in position each tooth was air-dried and was etched with 37% phosphoric acid (Scotchbond[®] Etchant, 3M/ESPE, St. Paul, MN, USA) for 15 sec, as indicated by the manufacturer. After this, each tooth was treated with an adhesive bonding agent (Filtek[®] LS System Adhesive, 3M/ESPE, St. Paul, MN, USA) using a brush, air dried for 5 sec and light cured with a LED light (Elipar[®] S10 LED Curing Light, 3M/ESPE, ST. Paul, MN, USA) for 10 sec. The appropriate piece of the matrix foil was removed from the cast model and fitted on the proper tooth (Figure 2).

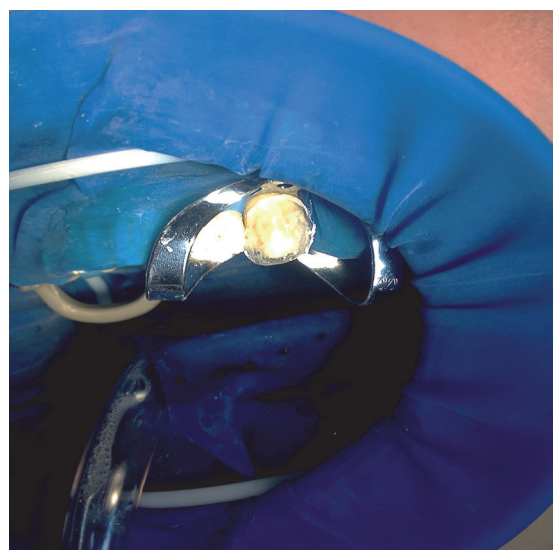


Fig. 2 – Matrix placed on the tooth 23 after acid etching and bond polymerization.

All the restorations were done with micro-hybrid composite material (Filtek[®] Universal Restorative Z250, 3M/ESPE, St. Paul, MN, USA). The composite material was inserted into the piece of the matrix foil in the pocket created from the labial wax-up only and was pressed on to the tooth so that the excess material would be pushed out. The excess material was removed with an interproximal explorer and the tooth was light cured for 20 sec as indicated by the manufacturer. The matrix was removed, the final touch up was done by adding more material and the tooth was further light cured for another 20 sec. The composite veneer was further prepared with fine-fissured dental burs and polished with polishing burs (NTI[®] Dia Gloss set, New Technology Instruments NTI[®], Thuringia, Germany). Upon finishing polishing of each tooth, the rubber-dam clamp was removed and placed on the next tooth. When each dental arch was completed, the veneer symmetry, midline, height of the incisal edges of all teeth, and the position of the occlusal line to the bi-pupillary line were checked (Figure 3).

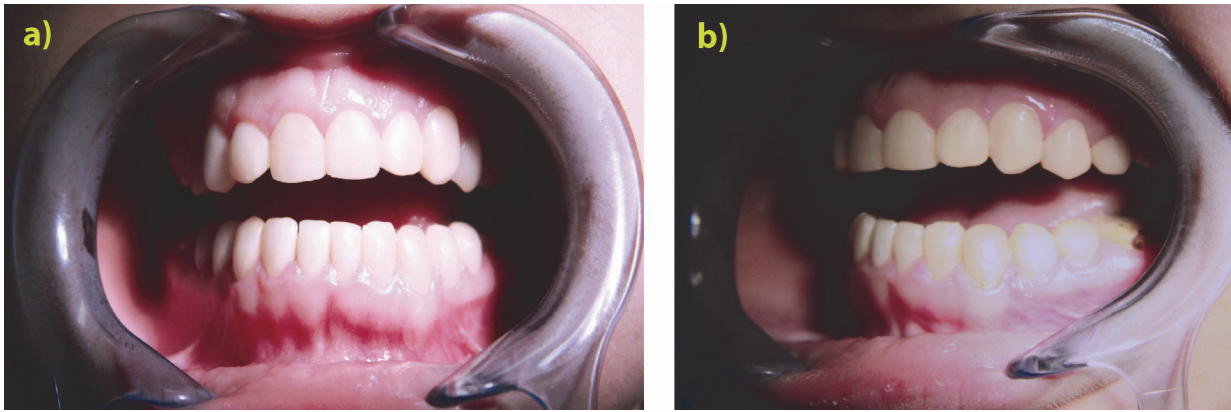


Fig. 3 – a) Anterior and b) side view of the postoperative result.

The patient was instructed how to maintain oral hygiene with brush, floss, and interdental brushes to control the level of dental plaque until the next visit. Fluoride application to all teeth was done after the completion of the procedure.

Post-op check-ups confirmed a solid and firm bond between the composite material and enamel surface on all teeth with AI. The three-month post-op checkup did reveal a small amount of discoloration on teeth 13, 15, 25 and 32, which were made by food and liquid staining as the patient is a non-smoker. The stains were removed with disc burs and new material was added with ease where needed.

Discussion

This case study focuses on the AI hypomaturation type, which exhibited white opaque enamel, with yellow-brown discolorations that easily chips from the underlying dentine.

AI represents a challenge for clinicians in dentistry because it creates great functional and esthetic problems that are hard and costly to restore, requiring multiple visits to the dental office². In dentistry today, the final solution for AI patients are metal-ceramic or full ceramic crowns and bridges. However, it is important to understand all the aspects of the problem that the patient with AI may have and their desires before deciding upon the final treatment⁵. Restorative materials today have excellent esthetic and functional properties that allow the clinician and the patient to have more options for the treatment⁶. The attempt to restore the AI affected teeth with composite materials represents a novel approach in dentistry today and must be approached with caution. It is important to critically analyze the patient's, psychological status, economic status and the type of the AI present in the dentition so that the final result is both esthetically and functionally pleasing¹¹. Sabatini and Guzmán-Armstrong¹² report that the new method called "modified clear matrix technique" allows for the simplification of the restorative process with composite materials in the patient with a generalized form of AI. They point out the possibility of using the matrix foil to create a good composite foundation for the final restoration. This, in turn, reduces the time spent on each tooth, chair time, the number of visits to the dental office and the cost of the whole procedure.

When planning this procedure it is important to examine the age, socioeconomic status, subtype of AI in the mouth, the level of oral hygiene, the presence of occlusal anomalies, and the time of completion of the procedure that best suits both to the patient and the clinician¹³. The female adolescent patient in this case report was primarily concerned with physical appearance of her smile and the cost needed to achieve the proper esthetic result. The modified clear matrix method for esthetic composite veneers was chosen for her because of the proper cost, promptness, and good esthetic results. The positive aspect of this technique is the good esthetic and functional restoration of the facial surfaces of teeth directly in the patient's mouth within one visit. Furthermore, it is possible to administer corrections if any problems should arise during the course of mastication after the procedure, using the same matrix that had been originally utilized¹⁴. The teeth in the esthetic zone had sufficient enamel for minimal preparation and the analysis of cast models indicated that the proper thickness of the composite restoration could be placed on the facial aspects of all teeth so that all the discolorations on them would be hidden. Minimal preparation included removing a minimal amount of enamel required to realize the proper roughness of the surface and to achieve good depth for the slots, which in turn provided good retention of the final restoration. Both of these conditions allow for a good bond between the enamel and the composite veneer, which was agreed upon during the check-ups ten days and three months after the procedure. During the checkups no composite restoration was detached from the underlying enamel. The discolorations on some restorations did arise but this was quickly removed with dental disc burs. The patient did not report any sign of discomfort, hypersensitivity during and after the procedure or any trouble with mastication. The shape of all restorations dictated a good esthetic result but also needed to be such so that the patient could maintain a proper oral hygiene. The patient received proper oral hygiene training related to composite veneers.

Using the clear matrix technique the patient's needs in terms of prompt procedure and cost were satisfied. Furthermore, good esthetics and functionality were properly achieved in a short time period, which benefits the clinician as well as the patient. The time period between check-ups

gives the patient time to adapt to the changes and to point out if any of the teeth need to be changed in appearance. For all postoperative treatments, the original matrix foils were used and provided an easy retreatment. It is important to indicate the need for a rubber dam (OpraDam[®]) that creates the proper dry conditions for a good bond between the composite resin and the enamel. Also, it is important to follow closely the actual manufacturer's instructions for each bonding step. The fabrication of wax-up models in the laboratory allowed for making of clear matrix foils for both mandibular and maxillary arches. That in turn provided fast and precise veneer restorations during the actual operative session in the dental office. This was important since a great number of teeth needed to be prepared and composite veneers fabricated in one session.

Advantages of our modified method are the following: clear matrix method generates composite veneers; prefabricated wax ups allow for easy matrix fabrication; minimal amount of tooth structure needs to be removed; minimal free handed modification needed; dividing the matrix foil

into individual pieces, where each piece fits one tooth at a time, enables that interdental contact points are not affected; fluoride application upon completion of the restoration is possible.

Conclusion

This case report describes oral rehabilitation with composite materials of an 18-year-old female patient who presented with one of the hypomaturation subtypes of the *amelogenesis imperfecta*. Restoration included the esthetic zone of the mouth and the procedure described was the modified clear matrix technique for composite veneers for both the maxillary and the mandibular arches. A new dental material technology, allows today, to simplify the process of restoring *amelogenesis imperfecta* patients permitting evasion of radical prosthetic rehabilitation. Our modified clear matrix method produces better comfort, functionality, treatment speed, esthetic results, and cost efficiency in comparison to fixed prosthetic rehabilitation.

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