

All-ceramic restorations for complete-mouth rehabilitation in dentinogenesis imperfecta: A case report

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Prosthetic treatment of patients with dentinogenesis imperfecta is a challenge for the dental practitioner because numerous factors have to be considered. The use of all-ceramic restorations to rehabilitate the dentition of a young patient with dentinogenesis imperfecta is reported. Clinical and laboratory procedures are described. (*Quintessence Int* 2002;33:656-660)

Key words: abrasion, all-ceramic restoration, complete-coverage crown, dentinogenesis imperfecta, erosion

Dentinogenesis imperfecta is an autosomal-dominant anomaly that occurs with equal frequency in both sexes and appears mainly in the white population. Dentinogenesis imperfecta has been classified into three types, according to the characteristics of each case: type I (osteogenesis imperfecta-associated), type II (hereditary opalescent dentin) and type III (Brandywine isolate opalescent dentin).¹⁻⁴

Type I appears in 20% to 40% of patients with osteogenesis imperfecta and has a frequency of 1:20,000. Type II and type III have a frequency of 1:8,000.^{5,6}

The histologic structure of the dentin in dentinogenesis imperfecta appears relatively normal, but the number of dentinal tubules is decreased. The characteristic scalloping at the dentinoenamel junction is diminished or absent.⁷⁻¹¹ This scalloping is supposed to provide mechanical interlocking between the dental hard tissues. When the scalloping is missing, the enamel prisms can be easily detached. As a result, the teeth exhibit severe abrasion or fractures.^{12,13}

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Clinically, the teeth have a dark brown opalescent appearance and an irregular surface as a result of abrasion. Radiographically, tooth roots are short and have a smaller cervical diameter. The pulp chamber or the root canals may be completely absent. Frequently, periapical lesions are present as a result of necrosis.^{3,4,14-16}

The dental treatment in cases of dentinogenesis imperfecta is focused on the protection of the existing teeth at an early stage to prevent complete loss of the dentition. The treatment options are usually limited to complete-coverage crowns because maximum protection is the goal. The preparation of the teeth must include all the enamel and provide resistance and retention form to the crown. In addition, the brittle tooth structure has to be considered.¹⁷⁻¹⁹

Endodontic treatment of teeth with dentinogenesis imperfecta may result in problems, because in most cases the root canals are narrow or absent. An exception would be in patients with type III Brandywine dentinogenesis imperfecta, in whom teeth show abnormally enlarged pulp chambers.^{13,16,17}

In cases of extreme abrasion or in older patients, overdentures are usually a treatment option, but this choice is generally not easily accepted in younger patients.²⁰ As in all extensive prosthetic therapy, the treatment goal is focused on preservation of the remaining teeth and restoration of function and esthetics.^{19,21}

The purpose of this article is to describe the prosthetic treatment of a patient suffering from dentinogenesis imperfecta.



Fig 1 Initial clinical situation before orthodontic treatment.



Fig 2 Preoperative panoramic examination.

CASE REPORT

Examination

A 15-year-old white patient with dentinogenesis imperfecta presented for orthodontic treatment (Fig 1). The diagnosis of dentinogenesis imperfecta had already been established before orthodontic treatment. Brackets were detaching frequently from the teeth with pieces of enamel and dentin adhered to the metal surfaces. At the end of orthodontic treatment, the patient was 15 years old and his teeth were restored conservatively with composite resin restorations for a period of 2 years until he reached the age of 17.

Although the orthodontic result was excellent, the patient was not satisfied with the appearance of his teeth. The teeth were a dark brown color and exhibited irregular surfaces and erosion; parts of the enamel were missing. Abrasion facets were present on most of the teeth, and many occlusal cusps were broken, exposing dentin.

The radiographic examination did not reveal any periapical lesions. The pulp chambers were regular to enlarged and related to the age of the patient. There were no root deformities. All third molars were impacted, but there was no indication for extractions (Fig 2).

Treatment planning

Following orthodontic treatment, initial impressions were taken, and the study casts were mounted on a semiadjustable articulator. A complete waxup was made for both maxillary and mandibular teeth (Fig 3).

The treatment plan for this patient included restoration of all teeth with complete-coverage all-ceramic crowns in a slightly increased vertical dimension of occlusion. The new crowns should restore the vertical height of the face, the occlusal anatomy and guidance, protect the teeth from further abrasion and destruction, and improve the esthetic appearance of the teeth.



Fig 3 Diagnostic waxup of the case.

All-ceramic restorations were considered because of their esthetics, biocompatibility, and accuracy for fit.²¹ For the construction of the all-ceramic crowns, the Empress System (Ivoclar) was selected because it allows the choice between staining and layering techniques, both based on a resistant, thermopressed core made from a wax pattern.

Tooth preparation

All teeth were prepared with a circumferential chamfer finishing margin, as dictated by the guidelines for all-ceramic restorations. The preparation depth was 1.5 mm for the labial surface, 2.0 mm for the occlusal surface and the cutting edge, and 1.5 mm for the lingual and palatal surfaces (Fig 4).

The teeth were immediately restored with provisional crowns made at chairside from autopolymerizing resin. Tooth preparations were accomplished in segments, and the observation period with the provisional restoration was 3 months.

Impressions were made with an addition-type silicone material; the corrective impression technique



Fig 4 Preparation of the teeth.



Fig 5 Wax patterns for the anterior crowns. Note two different kinds of wax are used: red for the cervical area and gray for the rest of the restoration.

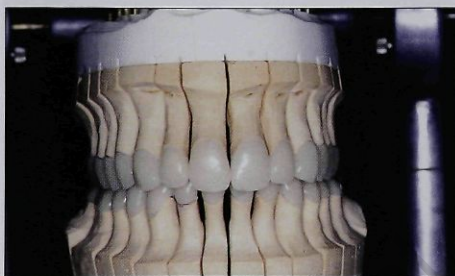


Fig 6 Restorations mounted on the articulator after glazing.

was used. Facebow and central relation registrations were made to allow articulation of the working casts.

From the final impressions, double casts were poured in type IV dental stone material. One cast was cut and provided removable dies, and the other was left intact. The first cast was used for the waxing and seating of the separate crowns, and the second was used to assess the emergence profiles and the crown-gingiva relationships.

The teeth were waxed at their full shape to achieve good marginal fit (Fig 5). The maxillary and mandibular anterior crowns were fabricated with the layering technique for better esthetic results. The posterior crowns were thermopressed to their full shape, and the staining technique was applied. In this way, better occlusal anatomy could be reproduced and maximum mechanical strength could be achieved.

The occlusal scheme in static and dynamic movements was developed carefully on the articulator. The use of a semiadjustable articulator with facebow registration is essential for achieving a long-term functional result (Fig 6).

The restorations were tried on the patient, and minor occlusal corrections were made before the final glazing. Extreme caution must be taken to protect the crowns from possible fracture.

Cementation

The restorations were cemented with the adhesive technique and a dual-polymerizing resin cement (Vario-Link, Vivadent). The dentinal surfaces were etched with 37% orthophosphoric acid and dentin bonding agents were applied (Syntac primer, Syntac bonding agent, Vivadent) according to the manufacturer's instructions. The internal surfaces of the crowns were also etched with 15% hydrofluoric acid (Ceramic Etching Gel, Ivoclar) for 10 minutes, immediately prior to cementation. This was intended to prevent any contamination of the bonding surface. A silane solution (Monbond, Vivadent) was applied to the etched surfaces to enhance the ceramic-resin bond.

After the complete dual polymerization of the resin cement, the excess material was removed with finishing diamonds. The occlusion was checked again, and the patient was scheduled for a 3-month recall program (Figs 7 to 9). A centric relation acrylic resin splint was delivered to the patient for night use to protect the restoration from extreme forces.

The restorations have been in clinical use for a period of 3 years without any functional problems.

DISCUSSION

The treatment of patients with dentinogenesis imperfecta is challenging for the dental practitioner. The goal of treatment is the protection of the remaining hard tissues and the restoration of the stomatognathic system.¹⁹ The enamel surface, although normal in its

Figs 7 to 9 Restorations cemented in the mouth.



Fig 7

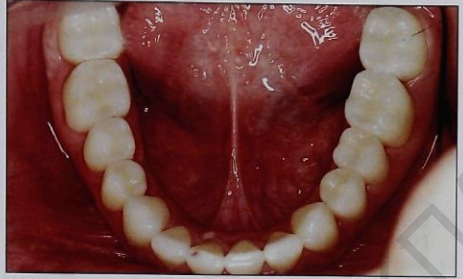


Fig 8



Fig 9

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