Case report

Complete Oral Rehabilitation of Dentinogenesis Imperfect: A case report

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Abstract

Dentinogenesis imperfecta, a type of hereditary disease, is characterized by defective teeth with enamel fracture or excessive wear. This disease is a challenge for prosthodontic treatment. This report describes an alternative treatment for the dentinogenesis imperfecta-affected teeth, combining the fixed and removable partial denture.

Keywords: craniomandibular dysfunction; occlusal appliance; splint, history; treatment protocol; dental materials

Introduction

Dentinogenesis imperfecta (DI) is a common disturbance of dentin formation, with an estimated incidence of 1:8000 [1]. According to the phenotypic variation, DI has 3 types. Type I-DI occurs with osteogenesis imperfecta; Type II-DI is not associated with osteogenesis imperfecta and is known as hereditary opalescent dentin, and Type III-DI is also called the “Brandywine type” [1]. As an inherited autosomal dominant trait and one of the most common inherited disorders in humans, DI is a localized mesodermal dysplasia affecting both the primary and permanent dentitions. Because of the abnormalities of dentin papilla, DI leads to the disorder of dentin. DI-affected teeth are opalescent like amber and have pronounced attrition in incisal edges or occlusal surfaces. Meanwhile, the root canal system of a DI-affected tooth is partially or totally obliterated [1]. Histologically, the enamel of a DI-affected tooth is normal, but the dentin contain irregular dentin tubules and large areas of uncalcified matrix. Moreover, the dentin tubules tend to be larger in diameter and less in number than those of normal teeth [2]. As a result, to protect the remaining tooth and restore the chewing function of a DI patient, a complete-mouth restoration is necessary [3].

Clinical report

A 26-year-old male Chinese came to our hospital with the chief complaint of bad appearance. The light amber teeth, some missing teeth and the severe attrition was found in the dentition, especially in mandible (Figure 1A). The rest parts of his body showed no abnormalities. The family history revealed that his mother and maternal grandfather were suffering from a similar condition.

Clinical examination revealed that the teeth were mainly yellowish brown in color and small in size. The dentition was not complete with the maxillary and mandibular left second premolars and mandibular right first molar (25,35,46 teeth) lost. The remaining teeth showed severe attrition with complete or partial loss of occlusal enamel. The mandibular incisors, canines, left first premolar and right first and second premolars were residual roots under the gingival level due to the long-term attrition. Class 1 mobility were found in the maxillary right first molar and left second molar, mandibular left first and second molars and right second molar (16,27,36,37,47 teeth). No complaint of dental pain was reported. The vertical distance between the maxillary and mandible was maintained in normal dimension because of
the occlusal contact between the maxillary and mandibular left third molars (28,38 teeth) (Figure 1A).

**Radiographic examination**

Digital-panoramic radiograph revealed the total obliteration of pulp chambers within all remaining teeth. The apical periodontitis were found in the maxillary right first molar and left second molar, mandibular left first and second molars and right second molar (16,27,36,37,47 teeth) (Figure 1B).

**Pathologic investigations**

The extracted hopeless teeth were sent to the lab for the Scanning Electron Microscope (SEM, KYKY-2800 microscope, KYKY Technology Development LTD) examination. This examination was performed with the approval of the ethical committee of the West China Hospital of Stomatology, Sichuan University. The images suggested that the DI-affected teeth had irregular calcified dentin tubules, and almost all the tubules were completely obliterated compared with that of normal dentin (Figure 2).

**Diagnosis**

According to above clinical examinations, radiographic findings and pathologic investigations, the diagnosis of dentinogenesis imperfecta (Type-II) was made.

**Treatment**

The ideal treatment plan for this patient is placing the endosseous implants for missing teeth followed by full mouth rehabilitation. Due to economical consideration and attrition condition of remaining teeth, the porcelain-fused-to-metal (PFM) fixed partial dentures were planned for maxillary teeth, and a removable partial denture was designed in mandible.

The treatment started with the extraction of hopeless teeth: the maxillary right first molar and left second molar, mandibular left first and second molars and right second molar (16,27,36,37,47 teeth). After the wound healed, prosthetic treatments were performed. Since the contact of the maxillary and mandibular left third molars (28,38 teeth) maintained an acceptable vertical distance, the rehabilitation was based on the original occlusal vertical dimension.

Although the maxillary lateral incisors, canines, and left incisor and first premolar (12,13,21,22,23,24 teeth) were shortened crowns, the incisal or occlusal edges of these teeth were above the gingival level, and their height could hold the fixed partial dentures. Root canal treatment was impossible for these teeth because of the total obliteration of pulp chambers. Shetty N et al. restored this type of tooth directly using the post-crown without the Root Canal Therapy (RCT) [3]. The restorative process included the preparation of the maxillary right incisor, premolars and molars and left second premolar (11,14,15,17,18,25 teeth) and the core building of the maxillary lateral incisors, canines, and left incisor and first premolar (12,13,21,22,23,24 teeth) (Figure 3). Then, the digital-panoramic radiograph was taken once again, which suggested the positions of the posts placed were within the roots. Then, the temporary plastic crowns were made. In the mandible, the residual roots under the gingival level made the post-crown restoration inappropriate. Therefore, a removable partial denture was designed to restore the mandibular dentition (Figure 4A).

After the removable partial denture was finished and placed, the vertical height of the jaw was recorded with wax. After the occlusal relation was recorded, the maxillary left third molars (28 tooth) were subsequently prepared, and the maxillary impression was taken (Figure 4B). For the maxillary dentures, because of the poor retention and resistance of remaining teeth, three combined crowns in the anterior teeth were designed, each with two abutments. In the posterior, as the first molars and left second molar (16,26,27 teeth) were lost, two fixed partial dentures were designed. After the try-in of the definitive restorations, the patient was pleased with the esthetic result and improved mastication (Figure 4C). He was advised to come for regular follow-ups.
Figure 2. The scanning electron microscope images.

A (10000×)

Figure 2A. The normal dentin.

B (10000×)

Figure 2B. The Dentinogenesis imperfecta (DI)-affected dentin.

Figure 3.

Figure 3A. The post-cores were made.

Figure 3B. Tooth preparations were finished for metal ceramic crowns.

Figure 4.

Figure 4A. The removable partial denture for the mandibular teeth.

Figure 4B. The fixed partial dentures of the maxillary teeth;

Figure 4C. Post-treatment intraoral view.
Discussion

The treatment strategy for the patients who suffer from the dentinogenesis imperfecta should be focused on protecting the remaining hard tissues and the restoration of masticatory function [4], with consideration of function, aesthetics and vertical dimension [3].

Treatment methods for the patient with DI-affected teeth include the over-denture, removable partial denture, and crown restoration [5]. A combination of fixed partial dentures and removable partial denture could also be a choice. In situations where the alveolar condition of the patient is suitable, the implantation is a good option [6]. The treatment options may vary based on factors such as the age of the patient, quality and quantity of the existing dental tissues, the condition of root canals, the periodontal conditions, and so on [7].

One uncertain factor in our treatment was whether the endodontic treatment was needed. Early endodontic treatment may be an accepted choice with good prognosis [7]. However, for adult patients the root canals of the DI-affected teeth are usually total-obstructed and cannot be prepared by endodontic instrumentation. Posts placed without root canal therapy were reported with satisfied clinical results [3]. As in this situation, during regular follow-ups for the patient, surgical endodontic treatment could be carried out in case of the apical inflammation. Another important factor is the vertical dimension. If the extreme attrition causes loss of vertical dimension, it must be increased before the restorative treatment [3]. In the mechanical strength, and the posts placed for the fixed partial dentures may weaken the resistance, so the combined crowns are a suitable choice for this situation.

Summary

The restoration of the DI-affected tooth, requiring the active involvement of various branches of dentistry, is challenging for the clinician. Early diagnosis, preservation of the remaining teeth and restoration of the function and esthetics are particularly important.

References
