Successful Bleaching of Teeth with Dentinogenesis Imperfecta Discoloration: A Case Report

AVINASH S. BIDRA BDS, MS*
FLAVIO URIBE, DDS, MS†

ABSTRACT

Dentinogenesis imperfecta (DI) is a hereditary condition that can cause discoloration of teeth in addition to other dental abnormalities. Patients often present to the dentist with a main goal of improving their esthetics. A myriad of treatment options have been described for this condition. This clinical report describes the management of a young adult with DI who desired improvement in dental esthetics after orthodontic treatment. As a result of his condition, the patient's dentition exhibited the classic generalized dark amber opalescence. A 14% hydrogen peroxide gel was used for bleaching of the maxillary and mandibular teeth, performed by the patient at home. The patient was followed at different intervals, and the improvement in teeth shade was significant and remained stable at 3.5 years. No adverse effects were observed. This article is the first case report in the literature describing the long-term follow-up of teeth bleaching in a patient with DI.

CLINICAL SIGNIFICANCE

Teeth bleaching may be considered as the first choice of treatment in dentinogenesis imperfecta patients. If successful, it offers a simple, conservative, and economical solution to satisfy the esthetic requirements of these patients.

(*J Esthet Restor Dent* 23:3–11, 2011)

INTRODUCTION

Dental abnormalities related to dentinogenesis imperfecta (DI) have been extensively described in the literature.[1–8] They include short bulbous crowns, short roots, obliterated pulp chambers, and a dark amber opalescence of all teeth.[3–8] The condition is hereditary and there is no cure. DI has been classified into three types for diagnostic purposes.[3] Type I refers to affected teeth in patients who also have osteogenesis imperfecta. Type II refers to affected teeth as an isolated dental trait, and Type III refers exclusively to affected teeth of a racial isolate in southern Maryland, and is known as the "Brandywine Isolate." Patients with DI are often concerned about their appearance and long-term dental care. Several authors have discussed the dental management of this condition, and a gamut of options has been proposed. These include carbamide peroxide bleaching,[9] complete coverage crowns,[10–12] veneers,[13] stainless steel crowns,[14] overdentures,[15,16] and dental extractions followed by fixed implant therapy.[12] The broad range of treatment options reported in the literature probably suggests

*Assistant Professor and Maxillofacial Prosthodontist, Department of Prosthodontics, University of Texas Health Science Center at San Antonio, TX, USA
†Associate Professor and Program Director, Division of Orthodontics, University of Connecticut School of Dental Medicine, Farmington, CT, USA

DOI 10.1111/j.1708-8240.2010.00379.x

that different levels of severity of DI exist among different patients. Therefore, there is a need for classification of DI based on different degrees of severity to recommend treatment guidelines based on the category of the condition.

Esthetic outcome is an important barometer by which a patient measures success and satisfaction of dental therapy. Often, a conservative treatment option may satisfy the patient's goal of esthetic therapy. Therefore, it is important for a clinician to first exhaust the conservative treatment options before proceeding to invasive treatment. Bleaching is one such option that has been well documented in the literature. However, there is only one case report that has described the use of bleaching in a DI patient.[9] The authors of this article had used a 10% carbamide peroxide bleaching agent successfully, but the period of follow-up was only 6 months. There are no clinical trials or other reports for bleaching in DI patients.

Though the prominence of evidence-based medicine has grown larger, case reports are still considered important as they have a high sensitivity for detecting novelty and form the basis for detecting new concepts, etiological clues, side effects, and new treatments;[17] furthermore, case reports lay the foundation for progress in clinical science, independent of basic subjects or epidemiological insights.[17] The purpose of this case report is to describe the successful use of 14% hydrogen peroxide for bleaching the teeth of a young adult with DI.

CASE REPORT

A 23-year-old white male was referred by his orthodontist requesting a prosthodontics consultation to improve his dental esthetics. The patient had been undergoing orthodontic treatment for the past 3 years in combination with orthognathic surgery. He had been diagnosed with Type II DI several years ago and was aware of his condition (Figure 1). The patient desired improvement of his dental appearance, especially the color of his teeth. Clinical assessment revealed that the severity of DI was mild to moderate but had an impact on the esthetic appearance of the teeth. The shade of the maxillary anterior teeth was determined as 5M1 using a shade guide. (Vitapan 3D Master Shade Guide, Vident, Brea, CA, USA). The mandibular anterior teeth appeared much darker and had a polychromatic appearance with multiple white spots in the cervical region. Minimal wear was noted on the occlusal surfaces of the teeth. The patient did not have any dental caries and had sound periodontal health. Clinical and radiographic examination confirmed the other findings related to the condition (Figure 2). Photographs were taken and the patient's diagnostic casts were mounted on a semi-adjustable articulator.

The patient's anterior teeth positions and proportions were esthetically acceptable. Therefore, it was understood that treatment for this patient would mainly be directed toward improvement of the shade of the teeth. The challenges of restorative dentistry because of his DI condition were explained to the patient; he was also educated about the importance of attempting conservative treatment measures prior to undertaking comprehensive treatment. Therefore, it was decided to first attempt bleaching therapy for his teeth. The patient's existing orthodontic vacuum-formed retainers were trimmed along the scalloped outline of the cervical margins of the teeth. The patient was prescribed a 14% hydrogen peroxide bleaching agent (Perfecta REV, Premier Dental, Plymouth Meeting, PA, USA) for use 15 minutes twice daily. The patient was given written and verbal detailed instructions about usage of this agent and informed of the potential sensitivity of his teeth. He was also advised to clean excess gel immediately in order to prevent bleaching and irritation of the gingiva.

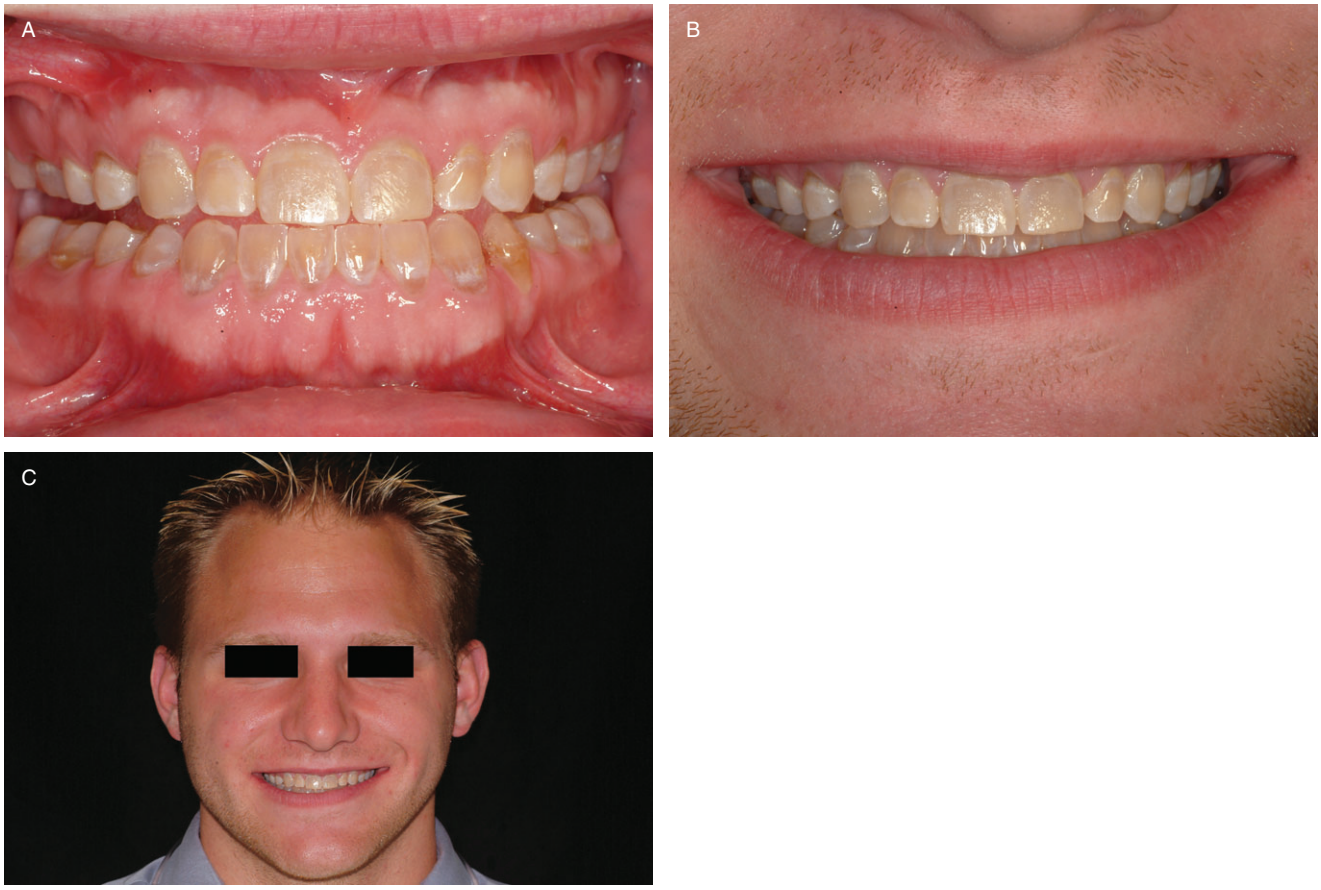

Figure 1. A. *Pretreatment frontal image of the teeth in protrusion showing the grayish-amber-like discoloration.* B. *Pretreatment close-up smile of the patient.* C. *Pretreatment full-face smile of the patient.*

Figure 2. Panoramic radiograph demonstrating classic features of dentinogenesis imperfecta. The metal hardware represents history of orthognathic surgery.

The patient was first seen after a 2-week interval and reported that he had been performing the bleaching regularly, as directed. Improvement in the shade of the teeth was noted, especially in the maxillary region (Figure 3). The patient was encouraged to continue the same regimen and was seen again after 2 months. The shade of all teeth showed significant improvement compared to his baseline condition (Figure 4). However, the cervical region of the mandibular teeth

Figure 3. A. *Two weeks after start of bleaching treatment: frontal image.* B. *Two weeks after start of bleaching treatment: close-up smile.*

Figure 4. A. *Two months after start of bleaching treatment: frontal image.* B. *Two months after start of bleaching treatment: close up smile.*

appeared to have improved lesser than the maxillary teeth. The patient reported transient sensitivity of all his teeth. The sensitivity was described by the patient as generalized and mild to moderate in nature and lasted for a short period after each bleaching experience. The patient also noted sensitivity of his mandibular gingiva after bleaching. He was advised to wipe off any excess bleaching gel that extruded on the gingiva immediately after application; subsequently, he was advised to use the bleaching agent, once per day.

The patient was seen again after two more months and further improvement was noted. The patient was satisfied with the improvement in the shade. He did not notice any further worsening of his adverse symptoms. At this stage, the patient was advised to discontinue the bleaching treatment (Figure 5). Thereafter, the patient was seen on annual recalls, since initiation of treatment (Figure 6). At a 3.5-year follow-up, the shade

Figure 5. A. *Post-treatment frontal image (4 months after start of treatment).* B. *Post-treatment month: close-up smile (4 months after start of treatment).*

Figure 6. A. *Twelve-month follow-up after completion of treatment: frontal image.* B. *Twelve-month follow-up after completion of treatment: close-up smile.*

remained stable (Figure 7). The shade was recorded on the maxillary anterior teeth as 1M1 (Vitapan 3D Master Shade Guide, Vita) (Figure 8). However, the cervical region of the mandibular teeth remained refractory since the 4-month recall. The patient's teeth remained vital and did not have any adverse reactions such as loss of surface morphology of the enamel, chronic sensitivity of teeth and gingiva, or pulpal damage related to the bleaching therapy. The patient was very satisfied with the esthetic outcome of treatment and chose not to pursue any supplemental restorative treatment.

DISCUSSION

Shade of the teeth has been regarded as the most important factor for patient's perception of dental attractiveness.[18] This may be especially true for patients with a condition like DI. Therefore, it is paramount that a dentist should first attempt conservative

Figure 7. A. *Three-and-a-half-year follow-up: frontal image.* B. *Three-and-a-half-year follow-up: close up smile.* C. *Three-and-a-half-year follow-up: full-face smile.*

modalities (such as bleaching) to attempt to ameliorate the teeth shade. This improvement may be sufficient for many patients and preclude them from undergoing elaborative dental therapy. In our patient, multiple treatment options were considered as "definitive" alternative solutions to satisfy the patient's esthetic needs. They included options such as full-mouth rehabilitation with complete coverage crowns, anterior crowns with posterior bonded-onlays, porcelain veneers, and fixed implant therapy. Complete coverage crowns in DI patients carry a risk of fracture due to the brittle nature of teeth;[5,7,12] bonded restorations including veneers are challenging to bond, and endodontic therapy and crown-lengthening procedures are very difficult in these patients.[12,19] Finally, full-mouth extractions and fixed implant therapy may be deemed as an aggressive treatment option for a young adult. The success of bleaching therapy in this patient precluded the need for these alternative modalities of treatment, which could have resulted in enormous expenses and have been time-consuming for the patient and the clinician.

Bleaching therapy has generally been dealt with increased skepticism due to lack of well-controlled

Figure 8. Shade taken at a 3.5-year follow-up shows shade 1M1 on the shade guide (Vitapan 3D Master, Vita). Compare with pretreatment shade of 5M1 (Figure 1A).

trials and high-quality scientific data. Additionally, long-term data has not been well reported in the literature.[20] In spite of this fact, this was the first option of choice used on this patient, as it was deemed to be the most conservative of all the treatment options available. Hydrogen peroxide was used as a bleaching agent, as it has been well documented in the literature.[20] It was decided to use this agent supplied as a 14% concentration gel, through a home-based protocol. The manufacturer recommends the use of this agent on a normal dentition for 15 minutes once daily in order to prevent any insult to the pulp. However, our patient was advised to use it twice daily for 8 weeks, due to his DI condition and the fact that penetration to the pulp chamber was not considered to be an issue due to the obliterated pulp chambers. It is also important to note that the tolerance level to hydrogen peroxide-based bleaching gel is different among individuals; therefore, at-home use of 14% concentration gel may not be necessarily applicable to other cases. A higher concentration such as 35% was not used through an in-office procedure, as controversy exists about its effects on the surface of the enamel after repeated usage.[21,22]

Though the general shade of all teeth improved significantly, the cervical region of mandibular anterior teeth was the most refractory. A possible explanation for this could be that this region did not experience the same amount of exposure to the bleaching agent compared to other areas of different teeth. This may have happened as the patient was probably conservative in using the agent in order to prevent bleaching and irritation of his mandibular gingiva by excess material that could escape when assisted by gravity. However, as the patient's smile does not reveal this region, the issue was less of a concern to the patient and the clinician.

CONCLUSION

Patients with DI condition present with different degrees of severity. There is a need for classification of DI based on different degrees of severity to recommend treatment guidelines based on the category of the condition. This case report described the successful use of hydrogen peroxide bleaching in a young adult with mild to moderate DI condition. The shade of the teeth significantly improved and was stable at 3.5 years. Future clinical trials are needed to investigate the efficacy of hydrogen peroxide bleaching in DI patients. This simple, conservative, and economic treatment modality may tremendously contribute to the quality of life of these patients.

DISCLOSURE AND ACKNOWLEDGEMENTS

The authors report no financial interests in any of the products described in this article.

The authors thank Dr. Jonathan C. Meiers DMD, MS and Dr. Sergio

M. Ortegon DDS, MS for their assistance in the dental treatment of this patient.

REFERENCES

1. Finn SB. Hereditary opalescent dentine. An analysis of the literature on hereditary anomalies of tooth color. J Am Dent Assoc 1938;25:1240–9.
2. Potts SJ. Hereditary dentinogenesis imperfecta. J Am Dent Assoc 1953;46:80–1.
3. Shields ED, Bijler D, El-Kafrawy AM. A proposed classification for heritable human dentin defects with a description of a new entity. Arch Oral Biol 1973;l8:543–53.
4. Witkop CJ. Hereditary defects of dentine. Dent Clin North Am 1975;19:25–45.
5. Malmgren B, Lundberg M, Lindskog S. Dentinogenesis imperfecta in a six-generation family. A clinical, radiographic, and histologic comparison of two branches through three generations. Swed Dent J 1988;12:73–84.
6. Gage JP, Symons AL, Romaniuk K, Daley TJ. Hereditary opalescent dentine: variation in expression. J Dent Child 1991;58:134–9.
7. Ranta H, Lukinmaa PL, Waltimo J. Heritable dentin defects: nosology, pathology, and treatment. Am J Med Genet 1993;45:193–200.
8. Witkop CJ Jr. Amelogenesis imperfecta, dentinogenesis imperfecta and dentin dysplasia revisited: problems in classification. J Oral Pathol 1988;17:547–53.
9. Croll TP, Sasa IS. Carbamide peroxide bleaching of teeth with dentinogenesis imperfecta discoloration: report of a case. Quintessence Int 1995;26:683–6.
10. Moundouri-Andritsakis H, Kourtis SG, Andritsakis DP. All-ceramic restorations for complete-mouth rehabilitation in dentinogenesis imperfecta: a case report. Quintessence Int 2002;33:656–60.
11. Groten M. Complex all-ceramic rehabilitation of a young patient with a severely compromised dentition: a case report. Quintessence Int 2009;40:19–27.
12. Henke DA, Fridrich TA, Aquilino SA. Occlusal rehabilitation of a patient with dentinogenesis imperfecta: a clinical report. J Prosthet Dent 1999;81:503–6.
13. Burgess JB, Hennon DK. Using laminate veneers to restore teeth affected with dentinogenesis imperfecta. Dent Child 1982;49:173–5.
14. Croll TP, Castaldi CR. The preformed stainless steel crown for permanent posterior teeth in special cases. J Am Dent Assoc 1978;97:644–9.
15. Walter JD. The use of overdentures in patients with dentinogenesis imperfecta. J Paediatr Dent 1988;4:17–25.
16. Joshi N, Parkash H. Oral rehabilitation in dentinogenesis imperfecta with overdentures: case report. J Clin Pediatr Dent 1998;22:99–102.
17. Vandenbroucke JP. In defense of case reports and case series. Ann Intern Med 2001;134:330–4.
18. Dunn WJ, Murchison DF, Broome JC. Esthetics: patients' perceptions of dental attractiveness. J Prosthodont 1996;5:166–71.
19. Pettiette MT, Wright JT, Trope M. Dentinogenesis imperfecta: endodontic implications. Case report. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998;86:733–7.
20. Hasson H, Ismail AI, Neiva G. Home-based chemically-induced whitening of teeth in adults. Cochrane Database Syst Rev 2006;(18):CD006202.
21. Souza RO, Lombardo GH, Pereira SM, et al. Analysis of tooth enamel after excessive bleaching: a study using scanning electron microscopy and energy dispersive x-ray spectroscopy. Int J Prosthodont 2010;23:29–32.
22. Cadenaro M, Navarra CO, Mazzoni A, et al. An in vivo study of the effect of a 38 percent hydrogen peroxide in-office whitening agent on enamel. J Am Dent Assoc 2010;141:449–54.

Reprint requests: Avinash S. Bidra, MS, University of Texas Health Science Center at San Antonio, Department of Prosthodontics, 7703 Floyd Curl Drive, MSC 7912, San Antonio, Texas 78229-3900, USA; Tel: 210-567-3700; Fax: 210-567-6376; email: avinashbidra@yahoo.com

This article is accompanied by commentary, "Successful Bleaching of Teeth with Dentinogenesis Imperfecta Discoloration: A Case Report," Yiming Li, DDS, MS, PhD, DOI 10.1111/j.1708-8240.2010.00380.x.