

## PROSTHODONTIC REHABILITATION OF A PATIENT WITH DENTINOGENESIS IMPERFECTA

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### ABSTRACT:

Dentinogenesis Imperfecta is an autosomal dominant disorder of tooth development characterized by the presence of opalescent dentin, resulting in a dusky blue to brownish discoloration of the teeth. This condition is genetically and clinically heterogeneous, it may affect only the teeth or it may be associated with the Osteogenesis Imperfecta. It is inherited as autosomal dominant trait and in fact it is one of the most common dominantly inherited disorder in humans. The scalloping at the dentinoenamel junction is thought to help by mechanically interlocking the two hard tissues together. This locking is defective in these conditions which lead to enamel fracture easily from the defective dentin. The exposed dentin may then undergo severe and rapid attrition. Early diagnosis and proper treatment is mandatory in these conditions. Delay in the treatment can cause partial or complete loss of clinical crowns with healthy roots. A case report is discussed in which a young patient with Dentinogenesis Imperfecta was treated with maxillary fixed partial dentures and mandibular fibre reinforced overdentures with metal occlusal surfaces.

**KEYWORDS:** Dentinogenesis Imperfecta, fibre reinforced, overdentures

### INTRODUCTION

Human dentition is subject to considerable variations in size, form, and number of teeth as well as in the structure of the dental tissues. Disorders of the teeth may be hereditary. Dentinogenesis imperfecta is one such disorder<sup>1-3</sup>. It was probably first recognized by Barret in 1882. The first published report describing the disorder as an enamel defect was by Talbot as quoted by Witkop<sup>1</sup>. Excellent studies of the chemical, physical, histologic, radiographic and clinical aspects of dentinogenesis imperfecta were made by Finn in 1938 and by Hodge and his coworkers in 1939<sup>3</sup>. The term 'hereditary opalescent dentin' was first used by Skillen, Finn and Hodges, to describe the brown translucent teeth that have an opalescent sheen and are lacking in pulp chambers. Many authors termed it as hereditary opalescent dentin as it describes the general appearance better<sup>3</sup>.

Dentinogenesis imperfecta is a localized mesodermal dysplasia affecting both the primary and permanent dentitions. The disease is inherited in an autosomal dominant fashion with high penetrance and a low mutation rate. It is the most common dental genetic disease, affecting approximately one in 8000 births. Dentinogenesis imperfecta has been subdivided into three

types: type I is associated with osteogenesis imperfecta; in type II there is no associated osteogenesis imperfecta; and when the condition is associated with the Brandywine triracial isolate and large pulp chambers it is classified as type III<sup>1</sup>.

Clinically colour of the teeth varies from brown to blue, and is sometimes described as amber or grey. The enamel may show hypoplastic or hypocalcified defects in about one-third of the patients and in an affected person it tends to crack away from the defective dentin. The exposed dentin may then undergo severe and rapid attrition<sup>2</sup>. Radiographically, the teeth have bulbous crowns and constricted, short roots. Initially, the pulp chambers may be abnormally wide, giving the appearance of 'shell teeth', but they progressively get obliterated<sup>2</sup>. Histologically the dentin is composed of irregular tubules, often with large areas of uncalcified matrix. The tubules tend to be larger in diameter and less numerous in a given volume of dentin than in normal teeth<sup>1</sup>. Characteristic scalloping at the DE junction is lacking. This scalloping is thought to help mechanically locking the two hard tissues together and with its lacking enamel fracture easily<sup>3</sup>.



Fig.1 Pre operative photograph



Fig.2. Pre operative orthopantomograph

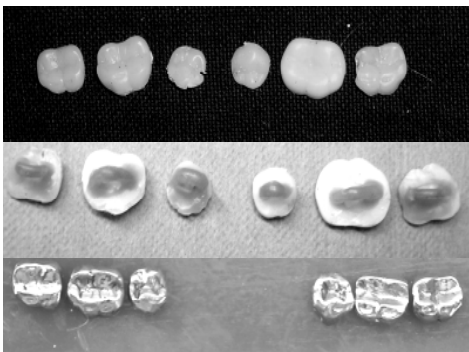


Fig.3. Fabrication of lower overdenture

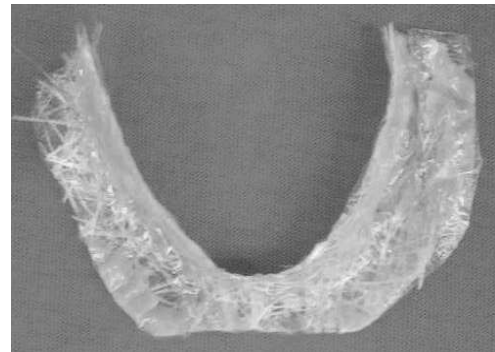


Fig.4 Pre-peg glass fibers

**Case History:**

A 30 year aged male patient came to Department of Prosthodontics, with a chief complaint of chipping of teeth while eating and dislodged fixed partial denture. Patient had normal primary dentition. He had experienced continuous chipping of tooth structure while masticating especially with the lower teeth since eruption of the permanent teeth. Mandibular Right molars were extracted due to fracture and attrition, two years back. Right maxillary first molar, left maxillary second molar and mandibular left first and second molar were extracted last year. Nickel-chrome fixed partial dentures were fabricated for the same. These fixed partial dentures were frequently coming out while eating. Family history suggests that his Uncle (mom's brother) has got opalescent brown, worn-out dentition. There was no history of any major illness or hospitalization.

Patient was well built, appeared well nourished with normal gait. No abnormality was noted with eyes, ear, nose, hair and nails. Patient exhibited a symmetrical facial pattern and competent lips. TMJ showed synchronized bilateral movements with no deviation. Intraoral examination revealed generalized attrition, shiny, opalescent yellowish orange dentition (Fig.1). Missing maxillary left first molar, Mandibular incisors and molars

except right third molar. Occlusal caries with right maxillary and mandibular third molar. Oblique enamel fracture with maxillary incisors. Badly carious right first molar. Soft tissue examination revealed no abnormal finding except inflamed marginal gingiva in mandibular left canine and premolar region. Orthopantomograph -OPG and full mouth IOPA x-rays revealed total obliteration of pulp chambers with mandibular canines and premolars (Fig.2). Partial obliteration of pulp chambers with rest of the teeth with abnormal pulpal morphology and cervical constriction. No evidence of any periapical pathology with any tooth was revealed. PA chest and PA skull was normal. Laboratory investigations revealed that enamel showed normal rod pattern, dentin showed irregularly calcified tubules and an almost completely obliterated pulp chamber.

After correlating clinical, pathological and radiographic findings, a diagnosis of DENTINOGENESIS IMPERFECTA (Type-II) was made in consultation with clinicians from oral medicine and oral pathology.

**Treatment Plan**

Ideal treatment plan for this patient should be placement of endosseous implants for missing teeth followed by full mouth rehabilitation. Due to economical

factors, full mouth rehabilitation with maxillary fixed partial denture and mandibular overdenture was planned.

#### Treatment Procedure

Diagnostic impressions were made. Scaling and polishing was done. Amalgam filling was done with maxillary and mandibular third molars. Mandibular canines and premolars were prepared to receive nickel-chrome overdenture copings, and these copings were cemented to their respective teeth. Special tray was fabricated for lower overdenture. Border moulding was carried out with low fusing impression compound (DPI Pinnacle Tracing Sticks, DPI, India). Wash impression was made in medium body PVS impression material (Aquasil, Dentsply Caulk, USA). Final cast was prepared, blocked out and duplicated. On the working cast temporary denture base was fabricated. Jaw relation was recorded and transferred to the articulator (Hanau H2). Teeth arrangement was done according to anatomical landmarks, maxillary dentition and aesthetics. Crown lengthening was carried out with maxillary teeth. Root canal treatment was not possible so worn out tooth structure was build with core-build up composite (Lumiglass, Dentsply Caulk, USA) and reinforced with titanium pins (minim pin, Whaldent Intl, New York, N.Y.) for each missing cusp. Upper teeth were prepared according to the occlusal surface of lower overdenture teeth. Provisionals were fabricated. Balanced occlusal scheme was followed for occlusion.

Lower overdenture was flaked and dewaxed. After dewaxing posterior teeth were removed from their indentations and sectioned horizontally from occlusal 1/3<sup>rd</sup> level for the fabrication of metal occlusal surfaces. Wax Loops were placed at the back of sectioned teeth for anchorage. These sectioned occlusal surfaces with loops were casted in Nickel-chrome (**Fig.3**). These metal

occlusal surfaces with the help of loops were luted to their remaining part of the teeth with tooth coloured self cure acrylic resin (DPI India) and placed into their respective indentations.

#### Reinforcement of the Denture Base

Silanized glass fibres were impregnated with monomer and polymer in layers on polyethylene sheet. These layers were packed and stored in refrigerator for overnight. This layered fibre sheet called as pre peg, was cut according to the spacer outline so that fibers should not expose on the borders. [**Fig.4**]. This pre-peg was then sandwiched in dough of heat cure acrylic (Lucitone, Dentsply, Caulk, USA) and packed (compression

moulding technique). Curing was done. Finished lower overdenture was evaluated intraorally.

#### Fabrication of Maxillary Restorations

Final preparation of the maxillary teeth was done. Gingival retraction was done with retraction cord (Ultrapack, Dentsply, USA) impregnated with haemostatic agent (AlCl<sub>3</sub> MP Sai India). To prevent relapse of marginal gingiva before loading of impression material and to have uniform space for impression material, impression was made with matrix impression technique(**Fig.5**).

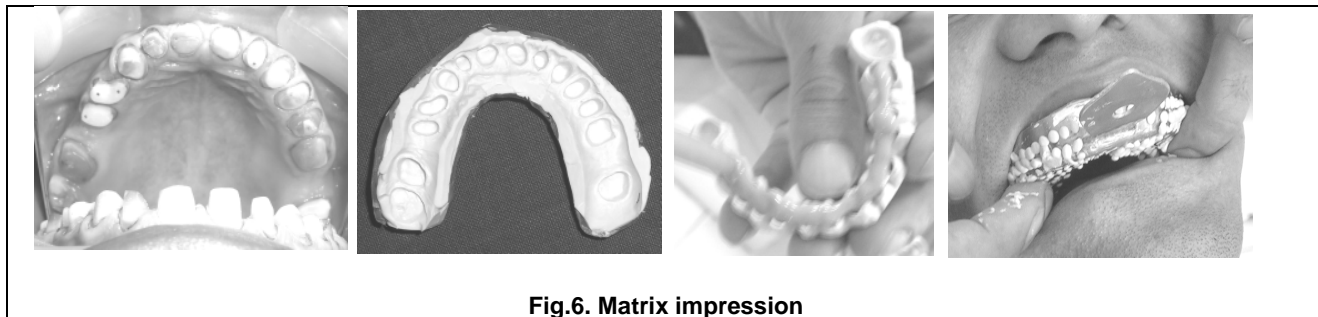


**Fig.5 Accentuation of cervical projections**

#### Matrix impression

Two layers of base plate wax ( Modeling Wax II, HDL, India) were adapted on the diagnostic cast. Over this base plate wax a thick aluminium foil was adapted, over which a wax template was prepared (**Fig.6**). Bite registration material (Exa Bite, GC, America Inc.) was injected into this template and placed onto the prepared teeth. After final setting matrix was removed(**Fig.6**). Wax template was removed from the bite registration material. Excess material wax cut away from the impression side. Interdental scalloping was done with the help of scalpel so that cervical projection will be seen prominently (**Fig.5**). This matrix was then evaluated in the patient's mouth for proper extension of projections into the gingival sulcus.

Light body PVS (Aquasil, Dentsply, Caulk, USA ) impression material was injected into the matrix and placed on the prepared teeth after removal of retraction cord (**Fig.6**). Putty PVS impression material (Aquasil, Dentsply, Caulk, USA) was mixed and loaded in a stock metal tray and placed over the matrix (**Fig.6**). After the final setting the tray was removed in toto and poured in



**Fig.6. Matrix impression**

type IV die stone (Kalrock, Kalabhai, India). Centric relation was recorded along with overdenture and transferred to the articulator. Maxillary metal ceramic fixed partial dentures and full crowns were fabricated and luted with temporary non-eugenol cement (Temposil, Coltene Whaledent, Switzerland). Patient was recalled after 15 days for follow up and final cementation was done (**Fig.7**).

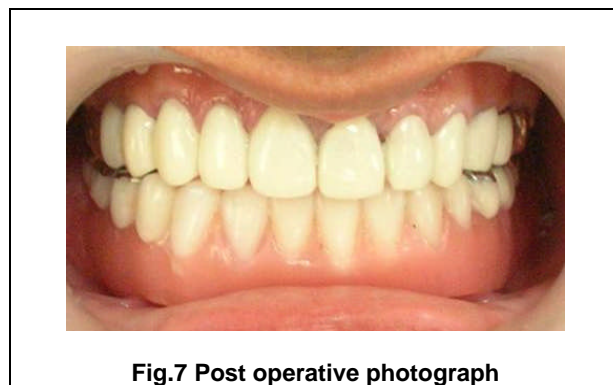
### Discussion

This clinical report illustrates one solution to the problem encountered when restoring a patient with a congenital abnormality such as Dentinogenesis imperfecta. Maxillary arch had most of the teeth attrited, with few teeth missing in the maxillary arch. The teeth remaining showed evidence of enamel fractures so maxillary arch was rehabilitated with full crowns and fixed partial dentures. In mandible most of the teeth were missing and remaining teeth were severely attrited hence a mandibular overdenture was planned.

Ideally single complete denture is not indicated in mandible. As the denture base coverage area is very less so there are chances of midline fracture, due to flexural fatigue and impact force. To avoid this complication in this case denture base was reinforced with glass fibres which is supposed to be one of the best choice for denture reinforcement. To strengthen polymer resins by including glass fibres, there should be good adhesion between the polymer matrix and the fibres. Untreated fibres act as inclusion bodies in the acrylic resin mixture and weaken the resin. The silanized glass fibres by soaking into the monomer by pre peg dough technique improve the fracture resistance markedly<sup>4</sup>. Further in single complete dentures there are chances of abrasion of acrylic teeth, to avoid this metal occlusal surfaces were prepared<sup>6</sup>.

In cases of Dentinogenesis Imperfecta, it is always better to avoid intentional root canal treatments due to bizarre pulpal anatomy. For the reinforcement of fractured teeth, core was built with dual cure composite and reinforced with amalgam pins for each missing cusp<sup>3</sup>. Maintaining gingival retraction for full arch impression is

difficult. For taking out of retraction cord from one side of arch to the other side, tooth by tooth takes time. As gingival retraction is a transient phenomenon, there are chances of relapse. In cord retraction procedure, the gingiva begins to relapse immediately on removal of the cord and continues to do so during seating of the impression tray and until polymerization of the impression material occurs. Collapsing forces are also generated by the impression procedure. Once the cord is removed retracted gingival tissue is unsupported. Typically, the tray impression material contacts the gingiva and collapses the tissues against the prepared tooth. Wash or reline impression procedures provide no inhibition to collapsing forces, also there are no displacement forces generated to direct gingival tissue away from the prepared tooth. Four forces that must be controlled when making subgingival impressions: retraction forces, displacement forces, collapsing forces and relapsing forces. This can be easily achieved with the help of Matrix impression technique. This system requires series of three impression procedures, using three types or viscosities of impression materials<sup>5</sup>.



**Fig.7 Post operative photograph**

### SUMMARY AND CONCLUSION

Dentinogenesis Imperfecta makes the person appear older even in very young age. Prosthodontic rehabilitation of this kind greatly improves function, aesthetics and proves to be great psychological boost to the patient's well being.

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