CASE REPORT

Chronological hypoplasia: aesthetic management

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SUMMARY

Enamel hypoplasia is defined as a break in the continuity of enamel with a reduction in the layers leading to depressions or grooves. Chronological hypoplasia is differentiated from other forms of hypoplasia due to its characteristic presentation (multiple, symmetrical, chronological pattern). Chronological hypoplasias are seen at the time tooth erupts into the oral cavity leading to several problems like aesthetic problems, tooth sensitivity, caries and early pulpal involvement. Prevention of interaction of aetiological factors is not possible because multiple factors are required for enamel synthesis. This paper highlights how to diagnose, intercept and treat chronological hypoplasias. It also mentions reasons for treating a case and different modalities available.

BACKGROUND

Amelogenesis is a genetically controlled mechanism but is prone to environmental insults. The enamel is prone to numerous insults which interact at different stages—formation, calcification and maturation either prenatally or postnatally.¹ Depending on type, timing and duration of insult, a variety of hypoplasias can occur.² Chronological hypoplasia (linear enamel hypoplasia) is a specific type of hypoplasia occurring due to environmental insult unlike amelogenesis imperfecta that has a genetic component. Even clinically they can be distinguished from other types of hypoplasias due to its *multiple, symmetrical, chronological pattern, linear, ring-like* pattern involving *all* surfaces of tooth.² Depending on severity, chronological hypoplasia can cause problems like aesthetic problems, tooth sensitivity, caries susceptibility, occlusal wear, loss of vertical dimension, early pulpal involvement.³ Given that hypoplasias are present when teeth erupt, aesthetic problems arising from these hypoplasias are a big concern in children and adolescents.^{4 5} Aesthetic problems in female children especially are associated with psychological crisis and will require early interception. Most of the cases mentioned in the literature have rarely been able to correlate aetiological factors and positive history. All environmental factors cannot be recollected by patients or their guardians. A uniqueness in the present case is that there was a positive correlation between malnutrition (specific) at a particular age (1–2 years) and the specific clinical presentation (area of tooth involvement that mineralises corresponding to 1–2 years). However, it would be difficult to pinpoint which particular deficiency caused hypoplasia because enamel formation requires several nutritional factors.

CASE PRESENTATION

A 14-year-old girl presented with notched upper front teeth. Further history revealed that notches were present ever since the teeth erupted into the oral cavity. No history of positive trauma was present. Primary teeth did not have such abnormality. The parents accompanying the child were enquired regarding prenatal and postnatal history. Mother's obstetric history was unremarkable but child's postnatal history revealed that the child was hospitalised for a prolonged period around the age of 1–2 years. Parents recalled that the child suffered from severe malnutrition and required hospitalisation for 2 weeks until proper recovery.

General examination revealed a malnourished child. Child's height and weight showed severe deviation from standard general population height and weight charts for Indian population. Intraoral examination revealed dentition corresponding to chronological age. Signs of poor oral hygiene with generalised presence of plaque and calculus were seen. Hypoplasia (quantitative and qualitative deficiency) was seen in several teeth. The distribution of hypoplasia was symmetrical, chronological and showed a characteristic ring-like defect around the teeth. The ring-like deformity was seen in cervical aspect of 11, 21, 31, 32, 41 and 42; incisal edges of 12 and 22, midportion of 13, 23, 33 and 43, cuspal tips of 14 and 24 were seen (figure 1). The exposed dentine was extremely sensitive to probing and cold water.

INVESTIGATIONS

Vitality test were performed to check pulpal status. Intra oral peri apical views (IOPAs) were advised to rule out abnormal pulpal and periapical pathologies.

Figure 1 Facial view of hypoplasias.

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Figure 2 Working cast for mockup restorations.

DIAGNOSIS

Based on clinical presentation—*multiple, symmetrical, chronological pattern of tooth calcification, linear, ring-like pattern involving all surfaces of the teeth*—a diagnosis of chronological hypoplasia (linear enamel hypoplasia) was given. The *chronological pattern* showed the systemic illness would have occurred around the age of 1–2 years; this coincided with the patient's hospitalisation history. Malnutrition is believed to be the cause of hypoplasia.

TREATMENT

Partial veneers with composite material were planned. Composite veneers as opposed to ceramic veneers were planned keeping in mind the young permanent dentition.

Laboratory procedure: Working casts were made (figure 2). Next mock build up was performed and shown to patient for approval to continue the clinical procedure. A putty index was fabricated (figure 3) which would act as a matrix for multilayer composite buildup with different shades to give good aesthetics. (Putty index was used so that it could allow easy incisal buildup and multilayering of composite).

Clinical procedure: Putty index was checked for accuracy of fit. Rubber dam isolation was not performed as it could prevent adaptation of putty index to palate and maxillary premolar-maxillary premolar. Later the teeth were prepared for partial veneers-window preparations (figure 4—show removal of stained enamel-dentin), glass ionomer cement (GIC) base was given to protect dentin. Later etching; bonding agent; opaque, body and

Figure 3 Putty index with addition silicon.

Figure 4 Discolouration removal and glass ionomer cement base.

transparent composites were applied in incremental manner on proximal surfaces and incisal edges (figure 5). Finishing and polishing were performed to establish correct morphology. A gap of 1 week was taken to allow proper hydration of the teeth, thus allowing checking for aesthetic match (figure 6). Fluoride application was later performed to prevent ill-effects of dental caries on these hypoplastic teeth.

OUTCOME AND FOLLOW-UP

The patient is under regular review.

DISCUSSION

Chronological hypoplasia varies in clinical presentation depending on type, timing and duration of insult.² Schour and Massler (1941) proposed a chart concerning calcification of primary teeth and permanent teeth. This chart is routinely used to estimate the ontogenetic timing and duration of the insult.⁶ Prevention of chronological hypoplasia is difficult because several factors act prenatally or during early postnatal periods.⁷ The only option for chronological hypoplasia is interception. Several treatment options are available like bleaching, composite veneers (partial/complete), ceramic veneers, full veneer crowns (metal fused to ceramic or full ceramic), air abrasion or a combination of these can be used to treat aesthetic problems.⁸ Composite restorations were chosen for this patient compared to bleaching and ceramic veneers in children because of (1) lesser tooth preparation—in young permanent teeth the dentinal tubules are larger and

Figure 5 Over buildup of restoration.

Figure 6 One week postoperative view.

more dentinal cutting leads to exposure of deeper portions of dentinal tubules which have greater diameter (diameter of dentinal tubule increases towards pulp) thus restorative material can have greater ill-effects which should be limited; (2)

lesser trauma to pulp from tooth preparation; (3) no pulpal irritation from bleaching chemicals—the size of dentinal tubules in young permanent teeth are larger than permanent teeth—passage of chemicals into pulp is greater; (4) developing occlusion—the patient is aged 14 years and possesses dentition which is not stable thus requiring restorations to suit the dentition at that particular point of time and allowing revisions at a later age as occlusion settles; (5) modifiability of restorations-composites according to differing occlusions to suit particular age in contrast to ceramic veneers which would require complete replacement in the same situation; (6) cost and (7) brief procedural time.⁹ Also a mockup restoration on cast and putty index methodology was used to establish better contours of teeth in the present case. Use of putty indexing method over free hand composite buildup is emphasised in several studies.^{10 11} The advantages of putty index includes (1) ease of composite buildup, (2) better anatomy, (3) no wastage of material, (4) better contacts and contours, (e) need of lesser finishing and polishing and (f) greater behaviour management especially for children. Topical fluoride treatment was performed to prevent ill-effects of hypoplasia on hypoplastic teeth.

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Competing interests None.

Patient consent Obtained.

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Learning points

- ▶ Clinically chronological hypoplasias are distinguished by depressions/grooves which are *multiple, symmetrical, chronological pattern, linear, ring-like pattern on all surfaces* of the tooth.
- ▶ Chronological hypoplasia can cause problems like aesthetic problems, tooth sensitivity, caries susceptibility, occlusal wear, loss of vertical dimension and early pulpal involvement.
- ▶ Aesthetic problems in female children especially are associated with psychological crisis and will require early interception.
- ▶ Composite veneers provide better treatment options for children with hypoplastic defects.

This paper also enlightens the use of putty technique over free hand composite build up for chronological hypoplasia which include

- ease of composite build up,
- better anatomy,
- no wastage of material,
- better contacts and contours,
- need of lesser finishing and polishing and
- greater behaviour management especially for children.

REFERENCES

- 1 Lukacs JR. Markers of physiological stress in juvenile bonobos (*Pan paniscus*): are enamel hypoplasia, skeletal development and tooth size interrelated? *Am J Phys Anthropol* 2009;139:339–52.
- 2 Hutchinson DL, Larsen CS. Determination of stress episode duration from linear enamel hypoplasias: a case study from St. Catherines Island, Georgia. *Hum Biol* 1988;60:93–110.
- 3 Seow WK. Enamel hypoplasia in the primary dentition: a review. *ASDC J Dent Child* 1991;58:441–52.
- 4 Caufield PW, Li Y, Bromage TG. Hypoplasia-associated severe early childhood caries—a proposed definition. *J Dent Res* 2012;91:544–50.
- 5 Weerheijm KL. Molar incisor hypomineralisation (MIH). *Eur J Paediatr Dent* 2003;4:114–20.
- 6 Kahl B, Schwarze CW. Updating of the dentition tables of I. Schour and M. Massler of 1941. *Fortschr Kieferorthop* 1988;49:432–43.
- 7 Nelson S, Albert JM, Lombardi G, et al. Dental caries and enamel defects in very low birth weight adolescents. *Caries Res* 2010;44:509–18.
- 8 Daly D, Waldron JM. Molar incisor hypomineralisation: clinical management of the young patient. *J Ir Dent Assoc* 2009;55:83–6.
- 9 Feierabend S, Halbleib K, Klaiber B, et al. Laboratory-made composite resin restorations in children and adolescents with hypoplasia or hypomineralization of teeth. *Quintessence Int* 2012;43:305–11.
- 10 Behle C. Placement of direct composite veneers utilizing a silicone buildup guide and intraoral mock-up. *Pract Periodontics Aesthet Dent* 2000;12:259–66.
- 11 Blank JT. Simplified techniques for the placement of stratified polychromatic anterior and posterior direct composite restorations. *Compend Contin Educ Dent* 2003;24(2 Suppl):19–25.

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