



# Restorative management of dental enamel defects in the primary dentition

Hani Nazzal<sup>1,2</sup>  · Monty S. Duggal<sup>3</sup>

Received: 8 August 2018 / Accepted: 19 October 2018 / Published online: 23 November 2018  
© The Author(s) 2018

## Abstract

Management of primary teeth with enamel defects in the young child can be challenging. Many restorative techniques for the management of such teeth are available; however, factors such as patient's medical history, compliance, needs, pain experience, and expectations should be considered. Furthermore, management of such teeth might require short and long management treatment plans depending on the extent and severity of such defects.

**Keyword** Enamel defects · Primary teeth · Restorative management

## Quick reference/description

Enamel defects in the primary dentition, as a result of different genetic and environmental conditions, can result in pain, esthetic concerns, and tooth surface loss, therefore, affecting the child's quality of life. Management of such conditions is affected by several factors such as the type of teeth affected, extent of defects, tooth surface loss, prognosis and associated symptoms.

The following chapter summarizes different treatment modalities, in managing primary teeth with enamel defects, highlighting the indications, advantages, and disadvantages for each treatment modality.

---

✉ Hani Nazzal  
haninazzal@hotmail.com

<sup>1</sup> Paediatric Dentistry, Hamad Medical Corporation, Doha, Qatar

<sup>2</sup> School of Dentistry, University of Leeds, Leeds, UK

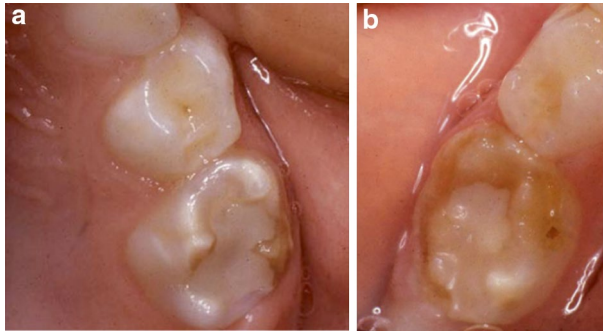
<sup>3</sup> Paediatric Dentistry Department, National University of Singapore, Singapore, Republic of Singapore

## Overview

It is prudent to highlight that caries prevention is essential in the management of all patients especially those with developmental defects of enamel. Following are different treatment options for restorative management of dental enamel defects in the primary dentition:

Treatment	Indications	Advantages	Disadvantages
<b>I. Interim restorations</b>			
Glass ionomer	Pain Sensitivity	Short-term alleviation of pain and sensitivity Short-term management of tooth surface loss Fluoride release and ease of application	Not a definitive restorative treatment
<b>II. Longer term restorations of posterior teeth</b>			
Composite resin restorations	Defect is demarcated to a defined area, not more than two surfaces No significant sensitivity Supragingival margins of the defect	Tooth coloured, good compressive strength	Hypomineralised enamel can potentially reduce the strength and integrity bond of enamel to composite resin Further tooth structure loss leading to defective restorations
Preformed metal crowns	The defect involves multiple surfaces There is significant sensitivity Margins of defects are subgingival There is involvement of the cusp tips in posterior teeth Enamel is prone to "chipping," especially in some cases of hypocalcified Amelogenesis imperfecta (AI) Uncooperative child requiring treatment under general anaesthesia as such child would not allow further treatment in the future	Good occlusal support provided by stainless steel crowns Requires minimal tooth preparation less bulky Failure rate is much less than other restorative materials Moisture control is less critical than when restoring with other materials Placement is less time consuming than resin restorations Are more cost effective as shown by the outcomes over time	Low esthetic results due to full tooth silver colour

Treatment	Indications	Advantages	Disadvantages
Pre-veneered metal crowns and white crowns	Large lesions involving multiple surfaces Subgingival lesions Sensitivity	Good esthetic results	Require more extensive crown preparation Higher cost Chipping can occur in the pre-veneered metal crowns Subgingival preparation in the zirconia crowns with more tooth structure loss Possibility of pulp exposures compromising pulpal health No available high-quality long-term success studies
III. Longer term restorations of anterior teeth			
Composite restorations	Demarcated lesions Large lesions involving multiple surfaces Sensitivity	Good esthetic results	Require tooth surface removal
Composite veneers	Diffuse lesions Large lesions involving multiple surfaces Sensitivity	Good esthetic results	Bulkier teeth Risk of composite chipping
Full coverage white crowns	Diffuse lesions Large lesions involving multiple surfaces Subgingival lesions Sensitivity	Good esthetic results	Require more extensive crown preparation Higher cost Chipping can occur in the pre-veneered metal crowns Subgingival preparation in the zirconia crowns with more tooth structure loss Possibility of pulp exposures compromising pulpal health No available high-quality long-term success studies
IV. Extraction of primary teeth with DDE (developmental defects of enamel)	Extensive tooth surface loss resulting in unrestorable teeth Pulpal involvement-irreversible pulpitis/necrotic pulps		Space required for developing dentition may be affected



**Fig. 1** a, b Example of the use of a glass ionomer cement used for interim protection on hypomineralised second primary molars (Courtesy of Nicky Kilpatrick)

## Materials/instruments

- Resin-modified glass ionomer (Fuji VII/triage, GC Corporation, Singapore)\*
- Compomer materials (Esthet.X, Dentsply, Surrey, UK)\*
- Preformed metal crowns (3M™ ESPE™ Stainless Steel Primary Molar Crowns, USA)\*<sup>1</sup>
- Pre-veneered metal crowns and white crowns such as NuSmile signature, pre-veneered kinder crowns<sup>®</sup>, and Zirconia crowns (NuSmile zirconia and Zirconia anterior kinder crowns<sup>®</sup>).

## Procedure

There are two main types of enamel defects:

**Hypoplastic:** caused by incomplete or defective formation of the organic enamel matrix by ameloblasts during tooth formation (secretory stage) resulting in thinner but normally mineralized enamel.

**Hypomineralized enamel:** occurs due to a failure in enamel matrix mineralization.

The decision to provide restorative management of enamel defects in primary teeth depends on several factors:

- Types of enamel defect.
- Extent and severity of the defects,
- Associated symptoms,
- Esthetics with possible psychological effects on the child,
- Patient cooperation and the method of treatment.

<sup>1</sup> \*Other products are available in the market and could be used.

## Interim restorations

An interim therapeutic restoration immediately alleviates pain and sensitivity. The provision of these interim restorations also allows the clinician to establish rapport with the child and assist in behavior management.

Materials such as resin-modified glass ionomer can be useful as these materials incorporate appropriate bonding for both enamel and any exposed dentin (Fig. 1). Glass ionomer could also be used for interim restoration.

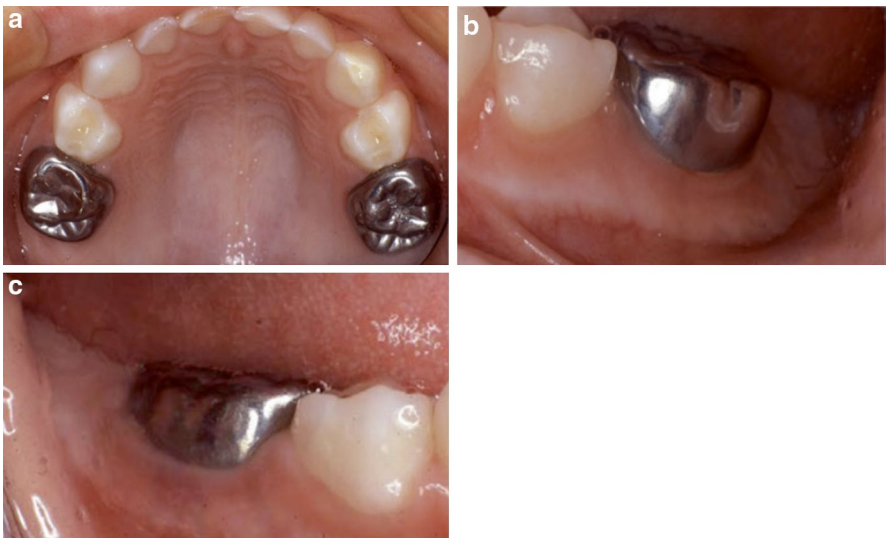
## Longer term restorations of molar teeth

### Composite resin restorations

Composite restorations are indicated in cases where:

- Defect is demarcated to a defined area, not more than two surfaces
- Cusp tips are not involved
- No significant sensitivity
- Supragingival margins of the defect.

Composite resin restorations require good isolation, preferably using rubber dam. Pretreatment with 5% sodium hypochlorite could improve composite retention through deproteination of hypomineralised enamel. Removal of excess enamel



**Fig. 2** Post-placement of stainless steel crowns on second primary molars using the Hall technique (Courtesy of Nicky Kilpatrick)

protein could make the enamel crystals more accessible to the etching solution, therefore, improving retention.

### Preformed metal crowns

The use of preformed metal crowns (stainless steel crowns) is a well-recognized option for the treatment of carious primary molars, and has an important role in the management of DDE-affected primary molars.

Following are the indications of preformed crowns:

- The defect involves multiple surfaces
- There is significant sensitivity
- Margins of defects are subgingival
- There is involvement of the cusp tips in posterior teeth
- Enamel is prone to “chipping,” especially in some cases of AI
- Treatment has to be carried out under general anesthesia and the child is unlikely to manage restorative care in the immediate future.

A technique, known as the “Hall Technique”, has been described mainly for the uncooperative child in which stainless steel crowns are placed with no preparation (Fig. 2). This technique is very useful in the management of primary teeth with DDE.

### Long term restorations of anterior teeth

Anterior teeth can be appropriately restored by composite restorations including the use of strip crowns when multiple surfaces are involved (Fig. 3).

The steps for placing strip crowns involve:

- Removal of approximately 1–2 mm of enamel from all the surfaces of the crown.
- The enamel is etched and prepared for bonding according to the manufacturer’s instructions and the crown is filled with composite, placed on the tooth, with excess removed from the margins and the composite cured.
- Once the strip crown has been removed, the restoration is finished in the usual manner.

**Fig. 3** Anterior primary incisors with zirconia crowns (Courtesy of Bernadette Drummond)



The use of full coverage white crowns, such as zirconia crowns, for restoration of anterior teeth is mainly indicated when more extensive tooth surface loss is evident with subgingival finish lines. The use of this technique is growing among clinicians although more extensive tooth surface preparation is needed with risk of pulp exposure as such crowns offer better esthetic results and full tooth coverage (Fig. 3).

### Extraction of primary teeth with DDE

Severely affected teeth with extensive tooth surface loss may require extraction. This should be done with evaluation of the space requirements in the developing dentition.

Preventive and restorative approaches should be preferred over extraction where possible.

### Pitfalls and complications

- Interim restorations are not a definitive restorative treatment.
- Hypomineralised enamel can potentially reduce the strength and integrity of composite resin bond to enamel.
- Pre-veneered and white crowns require more extensive crown preparation than preformed metal crowns.
- Higher cost of treatment in more generalized cases.
- Chipping can occur in the pre-veneered metal crowns.

**Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

### Further reading

1. Duggal MS, Nazzal H (2015) Restorative management of dental enamel defects in the primary dentition. In: Drummond B, Kilpatrick N (eds) Planning and care for children and adolescents with dental enamel defects: etiology, research and contemporary management. Springer, Berlin, pp 123–137
2. Welbury R, Gillgrass T (2012) Craniofacial growth and development, chapter 1. In: Welbury R, Duggal M, Hosey M (eds) Paediatric dentistry, 4th edn. Oxford University Press, Oxford, pp 12–13
3. McDonald S, Arkutu N, Malik K, Gadhia K, McKaig S (2012) Managing the paediatric patient with amelogenesis imperfecta. *Br Dent J* 212(9):425–428