RESEARCH SUMMARY

Study of enamel density

3D x-ray microscopic study of the extent of variations in enamel density in first permanent molars with idiopathic enamel hypomineralisation **J. Fearne, P. Anderson and G. R. Davis Br Dent J 2004; 196: 634–638**

Objective
To measure mineral concentration distributions within teeth with idiopathic enamel hypomineralisation, a condition in which developmental defects are seen in first permanent molars, and/or incisors.

Design
X-ray microtomographic and 3D x-ray microscopy.

Setting
UK University, 2001.

Materials and methods
X-ray microtomographic measurements of the extent of hypomineralisation in two affected molars and two contralateral controls extracted from the same patient.

Results
The control molars were visibly normal. The affected molars showed hypomineralised yellow opaque enamel with regions of breakdown. X-ray microtomographic images showed; a 20% reduction in mineral concentration of affected enamel (most cases involved full enamel thickness); hypomineralised enamel had a mineral concentration gradient opposite to that of normal enamel; regions of hypomineralisation distributed randomly throughout affected teeth, (apart from cervical region which was less severely affected).

Conclusions
The pattern of mineral concentration suggests a disturbance during the maturation process. Differences in susceptibility of the ameloblasts during different stages of dental development may explain the asymmetric distribution of the defects. Topical fluoride applications may help promote post eruption maturation of the surface layer in these teeth. The use of fissure sealants and adhesive materials appears to prevent further breakdown.

IN BRIEF

- Idiopathic enamel hypomineralisation (IEH), also known as molar incisors hypomineralisation (MIH) is a condition of unknown aetiology in which enamel defects are seen in one or more first permanent molars usually with one or more incisors affected.
- Laboratory studies were carried out on 2 affected and 2 apparently normal first permanent molars extracted from the same patient with IEH.
- Hypomineralised enamel was randomly distributed throughout the crowns of the affected teeth with a mineral concentration up to 20% lower than normal and a gradient form ADJ to surface reverse that of normal enamel.
- Post-eruptive breakdown of hypomineralised enamel did not occur in the fissure sealed tooth.

COMMENT

Even with the current advance in technology, there is still so much we do not know about the causes of enamel defects. Idiopathic enamel hypoplasia/molar–incisor hypomineralisation (MIH) is one of these conditions that still baffle the mind of both clinicians and scientist. As the term indicates, this condition has been reported clinically to affect the permanent incisors and molars only. Although the term 'hypomineralisation' was used, little is known of mineralisation level in the defective enamel. The authors in this paper used a relatively novel, but well established, x-radiographic technique, x-ray microtomography (XMT), to quantify the mineral concentration of the defective enamel compared with normal enamel. As this XMT technique is non-destructive, the authors were able to investigate the mineral distribution in the three orthogonal planes.

Their findings showed that the affected enamel had a reduction of 20% in mineral concentration. This reduction obviously weakens the enamel structure. Thus, when the tooth is subjected to the dynamic attack in the oral environment, it is not surprising that the enamel is broken easily. Another notable finding was the gradient of mineral concentration from the natural surface to the ADJ, the trend for the defective tooth is opposite to that in the control. This suggests that the disturbance is in the second phase of maturation. The authors also found that although the enamel was hypomineralised, fissure sealant can adhere to the enamel surface, providing protection against breakdown of the tooth.

In conclusion, this paper is the first one to quantify the mineralisation level of defective enamel with MIH. The results suggests that future research on MIH should investigate the disturbance in the second phase of maturation.

F. Wong, Senior Lecturer/Honorary Consultant, Paediatric Dentistry, Barts and The London, Queen Mary's School of Medicine and Dentistry
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