Histopathological characteristics of primary teeth in pre-term very low birth-weight child: Case report

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Abstract
Several studies have reported that the prevalence of enamel hypoplasia in pre-term low birth-weight children is higher than that in normal birth-weight children. However, the features of primary teeth dentin in pre-term low birth-weight children are rarely reported. We clinically examined a pre-term very low birth-weight child, and performed histopathological examinations of the extracted primary incisors. Hypomineralized enamel was observed in the permanent upper central incisors, while enamel defects were not detected in primary teeth. In the histopathological examinations, several features of dentin defects, such as irregular dentinal tubules and globular dentin, were observed on the pulpal side of dentin. These findings indicated that dentin formation in the present low birth-weight children was mainly affected during the natal and postnatal periods. Our results provide the evidence that tooth formation in low birth-weight children is affected by postnatal systemic derangement.

Case Report

Introduction
Infants born prior to 37 weeks of gestation are defined as pre-term and usually have a low birth-weight (<2,500 g). During the neonatal period, these children often suffer from various conditions, such as metabolic disorders and infectious diseases, because of their immature organ systems and poor adaptaption to the extra-uterine environment1). Dental complications in pre-term and low birth-weight children have been shown by several studies, and include a high prevalence of enamel defects in both primary and permanent dentition2–7). However, few aspects of dentin in pre-term children are known, since histopathological examination findings are rare. In the present study, we performed histopathological examinations of primary incisors extracted from a pre-term very low birth-weight child.

Case Report

The patient was a Japanese boy, born to nonconsanguineous and normally developed parents. At 4 months of pregnancy, the child encountered threatened miscarriage and was born by Caesarean operation at 30 weeks of gestation because of abruptio placentae. The birth-weight and height were 1,494 g and 39.0 cm, respectively, and the child was kept in an incubator for two months after birth. Growth retardation was noted as the boy aged (Fig. 1).

At 6 years 3 months of age, the patient was examined for dental caries at Osaka University Dental Hospital, at which time he was 111.0 cm in height and 16.5 kg in weight, which corresponded with a Japanese male at 4–5 years of age. An oral
examination revealed that primary teeth were yellow in color, and appeared normal in size and shape without hypomineralized areas (Fig. 2). Furthermore, all primary molars except the mandibular right second primary molar had dental caries (Fig. 3). After the upper primary central incisors were exfoliated at the age of 6 years 10 months, the upper permanent central incisors began erupting at the age of 7 years 8 months. At that time, broad hypomineralized areas were observed in the upper permanent central incisors (Fig. 4).
Histopathological examinations

After exfoliation, the 4 primary central incisors were used for histopathological examinations, following with parental consent. The teeth were fixed in 10% phosphate-buffered formalin and bisected buccolingually. Then, half of each tooth was decalcified in 10% ethylenediaminetetraacetic acid for 4 weeks,
after which the specimens were embedded in paraffin, sectioned at a thickness of 3µm, and stained with hematoxylin and eosin (HE). The other halves were embedded in a resin block, after which ground sections at a thickness of 50µm were prepared, and exposed to soft x-ray irradiation generated by a contact micro-radiographic device (Sofron Co., Tokyo, Japan) at 10 kVp and 5 mA for 10 minutes.

We observed a hypocalcified line in the area of the coronal dentin of the lower primary central incisor (Fig. 5a, b), which is similar to a neonatal line in enamel. In the present case, the pulpal side of the dentin near the line showed hypocalcification, compared with the enamel side (Fig. 5b). Whereas the dentinal tubules traversed the line in a continuous manner, the tubular pattern was irregular on the pulpal side of the dentin (Fig. 5b). Furthermore, unevenly calcified dentin matrix was observed on the pulpal side of the radicular dentin, while the cementum side of the dentin appeared to have normal structures (Fig. 5c–e). On the pulpal side of the dentin of the upper central incisor, a hypocalcified area related to the irregular pattern of dentinal tubules and reparative dentin containing entrapped cells, known as osteodentin, was observed (Fig. 6).

Discussion

Several studies have reported that the prevalence of enamel hypoplasia in low birth-weight children is higher than that in normal birth-weight children in both primary3-5) and permanent dentitions6,7). On the other hand, there are no known reports of dentin defects in low birth-weight children. In the present case, hypomineralized enamel was observed in the permanent upper central incisors of a pre-term very low birth-weight child, whereas no enamel defects were detected in primary teeth. Results of our histopathological examinations of the primary incisors showed several features related to dentin defects, such as irregular dentinal tubules and globular dentin.

Pimlott et al.2) examined 38 premature children with at least one maxillary incisor and reported a rate of prevalence of enamel hypoplasia in the permanent central incisors of 58%. Furthermore, Seow7) found that very low birth-weight children had a high percentage of enamel defects in the permanent first molars and incisors, and hypothesized that there is persistent systemic derangement sufficient to affect enamel formation postnatally in these children, because the permanent incisors and first molars commence their mineralization a few months after birth. In the present histopathological examinations, a distinct hypocalcified line was observed in the dentin of both the upper and lower primary central incisors, which were considered to be caused by the change in the environment after birth. Such a hypocalcified line, termed as “a neonatal line in dentin”8), is not clear in normal birth-weight children. In addition, features related to dentin defects were observed on the pulpal side of the dentin from those lines. These findings suggest that dentin formation in the present case was mainly affected during the natal and postnatal periods and that dentin formation in pre-term low birth-weight children may be affected by postnatal systemic derangement.

References