Exposed-plane-form enamel defects in a child from the foundling wheel of Santa Casa da Misericórdia, Faro, Portugal (16th-19th centuries)

Joana PAREDES¹, Maria Teresa FERREIRA¹, Sofia N. WASTERLAIN²

¹Department of Life Sciences, University of Coimbra, Portugal
²CIAS - Centro de Investigação em Antropologia e Saúde, Department of Life Sciences, University of Coimbra, Portugal

Introduction

During an excavation in Santa Casa da Misericórdia de Faro, Portugal, 51 sub-adult individuals that had been delivered to the institution through the foundling wheel were exhumed (16th-19th centuries). One 3-year-old child presented a noticeable enamel defect in the deciduous lateral incisors. The differential diagnosis of these lesions gave rise to several possible pathological conditions; namely, amelogenesis imperfecta, dental fluorosis, and dental enamel hypoplasia, which we discuss in the present work.

Individual nr. 58, sub-adult (±3 years-old)

Deposition: S-N, dorsal decubitus
Preservation: fairly preserved, relatively complete
Age-at-death: 2.4-4.3 years (Moorrees et al., 1963); 3 years ± 12 months (Ubelaker, 1989); 1.5-2 years (Schaefer et al., 2009)
All deciduous teeth present with the exception of central incisors, upper right lateral incisor and upper right canine.

The child presented plane-form enamel defects in the occlusal region of the labial surface of both deciduous lateral lower incisors. In these defects, the layers of enamel matrix are missing and a prominent step runs around the edge, above the contact area (Figure 1).

Both teeth present carious enamel cavities which clearly penetrate the dentine in the mesial contact areas, coinciding with the hypoplastic defects.

Discussion and Conclusion

Amelogenesis imperfecta, dental fluorosis, and dental enamel hypoplasia were the pathological conditions considered in the differential diagnosis. Amelogenesis imperfecta encompasses a group of conditions that demonstrate developmental alterations in the structure of the enamel in the absence of systemic disorder. However, two features are shared by all: the enamel is softer than normal and tends to chip from the underlying dentin (Wasterlain and Dias, 2009). In the child under study, none of these characteristics were observed. Regarding dental fluorosis, neither the lesions found were consistent with this condition nor is it probable that it occurred at that time in the south of Portugal. In fact, fluoridation was never introduced in Portugal and current natural soil fluorine levels in the region of Faro are very low (Wasterlain and Dias, 2009). The macroscopic and microscopic analyses lead us to consider enamel hypoplasias, more specifically exposed-plane-form defects, as the most probable diagnosis. According to the literature (Hillson and Bond, 1997; Hillson, 2001), exposed-plane-form defects are extensive and more commonly found in the occlusal part of the crown, which is in accordance to the observed in the present case. Such defects are the most noticeable manifestation of enamel hypoplasia, presumably representing a pronounced growth disruption. Among the conditions that have been shown to cause these enamel defects are fever and starvation (Hillson and Bond, 1997; Lewis, 2000).

Although several studies have tried to assess the age at which a defect was formed by measuring the distance between the defect and the cemento-enamel junction, Hillson and Bond (1997) argue that the position of the hypoplasia is more an expression of the pattern of enamel layers than the timing of a particular stress episode. Besides, the extent of a plane-form defect frequently has no relation to the duration of the stress episode that was in its origin (Hillson and Bond, 1997). Regarding the carious lesions observed in these hypoplastic teeth, it has long been known that hypoplasia form a line of weakness, along which enamel can be preferentially demineralized, and, therefore, predispose to caries (Hillson, 2001).

Child growth standards and non-specific stress indicators are frequently used as measures of the general health status of a community since their growth, development and diseases are sensitive indicators of the quality of the socioeconomic environment in which they live. Child survivability depends greatly on the surrounding environment, in particular, the level of sanitation and availability of healthcare facilities (Lewis, 2007).

This child also presents cribra morfolais and porosity in the zygomatic bone, pubis, ilia, and ischia, femur, tibia and foot bones. Moreover, the age-at-death estimation obtained by osteometric and dental methods showed disagreement, providing the first a younger age.

Despite the impossibility to infer a specific etiology for the observed lesions, their study is extremely important for a better knowledge of the degree of stress imposed to the children delivered to Santa Casa da Misericórdia de Faro. Enamel hypoplasias were also found in the permanent teeth of three other children: individual nr. 7 (1 year ± 4 months of age) had a linear hypoplasia in the upper right canine; individual nr. 46 (7.4-7.8 years of age) had one linear defect in the left lower first premolar; and individual nr. 63 (4.4-5.8 years of age) had two linear enamel hypoplasias in the left lower canine.

Material and Methods

The following methods were used to estimate the age-at-death: Moorrees et al. (1963) for dental calcification; Ubelaker (1989) for the sequence of formation and eruption of teeth; Schaefer et al. (2009) for the skeletal dimensions.

Skeletal measures (in millimetres) were obtained in the left side of the skeleton (or in the right side if the left bone was missing or severely damaged), using a sliding calliper and an osteometric board, following Schaefer et al. (2009).

Enamel defects (hypoplasia or others) were investigated macroscopically following Hillson (2003), with the aid of a low-power microscope.

References