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Disturbances in Tooth Mineralization and Forensic Dental Age Estimations

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Background:

When performing a forensic dental age assessment, mineralization disturbances of the teeth and the possible consequences these may have upon the reliability of the assessment must be taken into consideration. Furthermore, mineralization disturbances of a general character in the teeth may be seen as an indicator of more systemic insults during tooth formation and thus supplement the examination performed by the forensic pathologist. At our department the forensic dental age assessment is based upon a dental panoramic image, intra oral images of the third molars as well as a

clinical photograph of the front teeth in the upper jaw. The assessment of mineralization disturbances is based upon both the clinical photograph as well as the radiological images, where the assessment of the clinical photograph functions as a quick screening for mineralization disturbances. If there are signs of disturbances of mineralization in tooth formation, it should be further examined whether the disorder has impacted tooth formation and thus root growth. This could influence the assessment of the chronological age.

Aim:

The aim of this retrospective study was to see, if the notation of mineralization disturbances had impacted the given assessment of age in the age assessments performed at the Institute of Forensic Medicine in Copenhagen.

Material:

427 age assessments were performed in 2015. In 15 of these assessments mineralization disturbances were registered.

What are mineralization disturbances:

There are different definitions in the literature, but in broad strokes mineralization disturbances can be defined as "defects in the dental hard tissues arising during tooth formation. The defects may be of genetic origin, caused by inherited diseases or toxication, or the defects are idiopathic. MD can be local, affecting one or more teeth, or the whole dentition may be affected." (Ref 1).

Examples of mineralization disturbances from our assessments:

The following cases illustrate some of the mineralization disturbances encountered in individuals to be age assessed at our institute.

Case 1:



Case 1: This individual to be age assessed presented with fine horizontally running 'white stripes' across the front teeth of both the upper and lower jaw. The pattern and distance between the lines was consistent and the distance somewhat matched that of one year's tooth formation. Thus one theory was, that the mineralization differences were seasonal and might be caused by e.g. less nutritious food during the same part of the year. There was no anamnestic information of periods with less food available. The location indicated that they occurred approximately during the ages 0-6 old (as assessed by the location of the defects, ref. 2). Furthermore it was assessed – by combining radiological information with the photo, that these mineralization disturbances had no influence on root formation and thus did not impact the odontological age assessment.

Case 2:



Case 2: In this case the individual presented with mineralization disturbances where it was clearly visible that there was substance missing. This indicates a more substantial influence on enamel formation when the individual was approximately 2-4 years old (as assessed by the location of the defects, ref. 2). Again it was assessed, – by combining radiological information with the photo, that root formation was not affected and that the odontological age assessment was thus not impacted.

Case 3:



Case 3: A case where the individual to be age assessed presented with severe destruction of several teeth, missing teeth as well as supernumerary teeth. The tentative diagnosis was Amelogenesis Imperfecta. As this disorder only affects enamel formation it was assessed, that root formation was not affected and thus an age estimate was given. However it was noted, that there was a disorder present and that this might affect the result of the assessment.

Case 4:



Case 4: A case of mineralization disturbances in the form of discoloration of the front teeth with no substance loss present. This indicates a less substantial influence on enamel formation when the individual was approximately 2-3 years old (as assessed by the location of the defects, ref. 2). It was assessed that root formation was not impacted.

Results and conclusion:

- In six of the 15 cases it was assessed that the mineralization disturbances were of a local character and in nine cases of a general character.
- In one of the cases it was assessed that the root development of one third molar was affected, in the remaining that the disturbances had not affected the root mineralization and thus not affected the assessed age interval.