A134 Macroscopic Analysis and Scanning Electron Microscopy (SEM) of Immature Permanent Molars Immersed in Hydrochloric Acid (HCL, 38%)

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Learning Overview: After attending this presentation, attendees will understand the importance of expanding current studies of acid disposal to include immature, incompletely developed permanent teeth. Immature permanent third molars are typical to adolescents or young adults over the age of 15 years, thus studies contributing to current literature regarding acid disposal of dental tissues from this age group are relevant to the forensic sciences.

Impact on the Forensic Science Community: This presentation will impact the forensic science community in terms of competence by contributing to the comparative body of knowledge regarding immature dental tissues where acid was used in the means of disposing human remains.

In this study, morphological differences in a sample of immature permanent molars before and after immersion in HCL, 38% were evaluated macroscopically and using SEM with the goal of contributing to the body of literature regarding identification of dental tissues partially or nearly completely destroyed using acid. Four intact and non-carious immature, or incompletely developed, permanent third molars were selected as the sample for this study. The teeth used in this study have roots that are not completely formed, where the inferior portion of the root can be characterized by an open apex. The walls of the root are also much thinner than completely developed permanent molars. Incompletely developed permanent third molars are typical of adolescents or young adults over the age of 15 years. The teeth comprising this sample were extracted during the course of normal orthodontic practice and made available for educational purposes. The teeth were sterilized within a week of extraction using an autoclave (121°C, 15lbs psi). Standard odontometric measurements, weight, photographs, and imaging using a Nanoimages SNE-3200M mobile SEM were taken for each tooth before and after immersion in a commercially available formulation of HCL, 38%) within brief (1–8 hours), moderate (8–16 hours), and extended (over 16 hours) time intervals. After treatment, the teeth were dried, remeasured, and reimaged using the mobile SEM.

The results of the macroscopic analysis show the sample teeth exposed to acid for a brief duration exhibited transparency in color, gelatinous texture, minor changes in morphology of the crown, such as sharpening of the cusps, reduction in amount of enamel visibly present, and reduction in size of the tooth as measured using standard dental measurements and weight in grams. These changes intensify at the moderate and extended time intervals and are presented with SEM imaging. Microscopic morphological differences in the dental tissues are highlighted.

A dearth of literature exists describing the effects of acid on teeth using SEM imaging. This is especially true concerning adolescent teeth. However, the existing literature does establish acid immersion as a method of body disposal. When suspected human remains are found in acid, limited information is available to assist investigators in determining whether human remains are, in fact, present. Because teeth are the strongest part of the human body, they are more likely than other human substances to be found in a solid state. Teeth represent the most likely human tissue to aid in an investigation where acid is used as a means of body disposal. This research provides academics and practitioners new information regarding time estimates for human remains in acid as well as the ability to identify when HCL was used in the event the acid was strained.

Body Disposal, Hydrochloric Acid, Immature Dentition

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