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ANALYSIS OF BITEMARKS IN FOODSTUFF BY COMPUTERIZED TOMOGRAPHY (CONE BEAM CT) - 3D RECONSTRUCTION

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***Background:** The methods of registration and analysis of bite marks have evolved through the technological advances. Nowadays, the evolution of those methods it's a priority.*
The tridimensional analysis of forensic evidence has become a highlighted procedure when compared to the traditional methods. This tridimensional analysis is based on the registration of the surface of the bitten object.The authors propose the study of the surface and interior of the bitten object by cone beam computerized tomography (CB-CT), which is used in dental practice. In this study, CB-CT is applied to the analysis of bite marks in foodstuffs, which may be found in a forensic case scenario.
***Material and Methods:** Were used 6 different types of foodstuffs: chocolate, cheese, apple, chewing gum, pizza and tart (flaky pastry and custard). The food was bitten and dental casts of the hypothetical suspects were made. Tridimensional images of the dental casts and bitten objects were obtained using an x-ray source and the CB-CT equipment iCAT® (Imaging Sciences International, Pennsylvania, EUA). The software InVivo5® (Anatomage Inc, EUA) was used to visualize the images, measure its radiopacity at Hounsfield Units (HU) and to do the tridimensional analysis of the images.*
***Results:** There were obtained DICOM images in axial cuts from all the material in study. For each type of food a set of HU values was obtained, which varied between 194HU and -749 HU. The chewing gum had the highest value of radiopacity and pizza had the lowest. In all the foodstuffs the bitemarks contours could be identified.*
***Discussion and Conclusion:** The HU values attributed to each material allowed comparing the radiopacity of the foodstuffs and casts relatively to water and air. The HU intervals obtained for each material can be explained by its composition. The more heterogeneous and less compact is an object, the highest is its HU interval. The chewing gum, which is the most radiopaque (194 HU), has a well defined image; pizza (-171HU to -500HU) has a less defined image in what concerns the contours of the bitemarks. It was possible in all the foodstuffs to identify the teeth involved in the act of biting and to distinguish between the upper and lower dental arches. All the used materials were successfully reconstructed in three dimensional images. Through the axial cuts and tri-dimensional reconstruction it was possible to analyze the depth of the bitemark and dental arches.*
The method that we used, compared to the traditional methods of impression of the bitemarks in foodstuffs, allows a better registration of the evidence data. This is possible even in materials like the

custard of the tart, were it's not possible to use an impression material. In addition, in contrast to the impression methods, the CBCT is non-destructive, allowing the collection of DNA after the scanning of the object. Comparatively to the photographic methods, this technique added the third dimension. This allowed the tridimensional visualization of the object, obtained from the registration of its surface and interior. This method allows the correct registration of the entire biting surface, eliminating the distortion associated with the photographs. Furthermore, through the superficial and inner visualization of the object, it allows a rigorous analysis of the depth of the bitemark.
We can conclude that computerized tomography is an important tool for forensic sciences, namely for the registration and analysis of bitemarks in foodstuffs that may be found in a crime scene.

***KEYWORDS*:** Forensic Odontology, Bitemark, CBCT

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