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Dental Identification With Post Mortem MSCT Scan - A Novel Approach Using OsiriX®

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Abstract:
Purpose: To demonstrate the workflow used in the evaluation of Post Mortem MSCT as part of dental identification in single and possibly multiple fatalities. Method and material: The workflow in a couple of cases from the Section of Forensic Pathology in Copenhagen, Denmark is used to illustrate how the use of OsiriX DICOM Viewer and its tools can be applied to overcome some of the problems contained in MSCT images compared to the usual forensic orthopantomograms used in forensic odontology for identification. Results, discussion and conclusion: The combined use of tomograms (slices), 2D Mean Intensity Projection and 3D MPR/VR (3D Maximum Intensity Projection/Volume Rendering) was found to give a very useful first view for the forensic odontologist who is handling the bone and which can be used in reports both digitally and printed. The OsiriX DICOM Viewer provides many easy to use tools suitable for marking relevant structures/findings in the CT images.

Discussion
Advantages:
In each of the steps demonstrated above, the relevant images must be stored for future documentation purposes and used in reports both digitally and printed. The OsiriX DICOM Viewer provides many easy to use tools suitable for marking relevant structures/findings in the CT images.

In severely burned victims, the teeth are often brittle and can therefore easily be lost/damaged during the autopsy or during the intra oral examination. The Post Mortem CT scan images made prior to the autopsy will show the dental status of the body at the time of arrival at the forensic facility.

In a disaster situation with many victims, it would be an advantage to make a preliminary sorting of the victims regarding age, prosthesis amount of dental work - etc. This can be done quickly and does not require special knowledge from a forensic odontologist. Having access to the Post Mortem CT images would also allow the forensic odontologist to perform part of the PM registration in parallel with the autopsy and not needing physical access to the body.

In cases of terror attacks with nuclear-, bacterial- or chemical weapons, it will be dangerous to open the body bags and make the traditional dental clinical/visual inspection. Utilizing the Post Mortem CT scan, it might be possible to make the PM-recordings from the CT scan as outlined in this poster.

Problems:
The use and evaluation of Post Mortem CT images is a time consuming process, especially in the beginning, and requires experience / familiarization in order to be used in a routine context.

The forensic odontologist is used to inspecting the dentition from the oral cavity i. e. the upper jaw from below and the lower jaw from above. In the CT-scan, the images are orientated or presented as viewed from below. We find that this is a problem in the beginning and is quickly overcome with increasing experience.

The normal dental X-rays are 2D images of a summarized 3D structure. The slices in a CT-scan are a very different presentation of the same structures and contain cross sectional information in every imaginable plane. CT scanning images also make it possible to view the structures in 3D. Utilizing this postprocessing is essential in order to work around some of the limitations that the CT technique has compared to regular X-ray. These possibilities pose a challenge for the correct interpretation and require familiarity with the CT evaluational tools.

In cases with many metallic restorations (i.e. amalgam fillings, metal crowns etc.) close relations, Post Mortem CT scan has a major limitation compared to the traditional X-ray technique. In such cases, the detection of adjacent composite material fillings and other details needed for the DVI PM sheet is not possible by CT-scan.

Final thoughts:
Overall, in our opinion, Post Mortem CT scanning is a useful and important tool for identification purposes. In all identification cases, it is informative for the forensic odontologist to look through the scan before the clinical examination. This can target and facilitate the clinical and radiological examination. In some cases, we have been able to make a complete PM DVI description by only using the Post Mortem CT Images. Naturally, this is confirmed by clinical and radiographic examination.