## H36 A Novel Approach to Radiographic Identification of Skeletal Remains by the Z-Projection of Cranial Computerized Tomography (CT) Scans

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After attending this presentation, attendees will have a general understanding of how to process a CT image series into a z-axis projected image that can be used in conjunction with or in lieu of conventional antemortem radiographs to establish positive identification.

This presentation will impact the forensic science community by providing a methodology that simplifies a CT image series along the z-axis into one image that can be easily compared to a postmortem radiograph. Additionally, this methodology can be used to provide an antemortem radiograph of a missing person that could be used to compare to unidentified skeletal remains.

A primary objective of the medicolegal death investigation is to establish positive identification of unidentified remains via scientific means. In many instances, identity can be quickly determined via fingerprint comparison when the decedent has prints on record. Unfortunately, establishing positive identification becomes more challenging when the decedent is in advanced stages of decomposition or completely skeletonized, thus requiring the use of other methods, such as DNA or radiographic comparisons. Although DNA provides strong statistical support for identity, it is constrained by the availability of reference samples for comparison and has time and financial drawbacks regarding the processing and analysis of samples. Alternatively, radiographic comparisons are a likely means for positive identification because they obviate the practical and logistic limitations of other methods and are often readily available in many instances.

The use of CT imaging has steadily increased since its introduction into clinical medicine, resulting in the possibility of using antemortem CT data for identification purposes; however, most facilities that are tasked with conducting a medicolegal death investigation do not have access to CT equipment and cannot do slice-by-slice comparisons. Although CT scout films may be taken during a clinical exam, the image quality and/or view may not provide sufficient points of concordance to conclude a positive identification when comparing these antemortem films to postmortem radiographs. One solution to this dilemma is to utilize software that can project the CT image series along the z-axis (a z-projection) to create a 2D image. The resulting z-projection is essentially an inferior-to-superior radiograph, created by "flattening" the CT images, which can then be easily compared to postmortem radiographs taken using conventional equipment. This methodology is particularly useful when dealing with skeletal remains and could provide an additional approach for identification via radiological comparisons from antemortem CT images of missing persons to unidentified skeletal remains within the National Missing and Unidentified Persons (NamUs) database.

Creating a z-projection for identification purposes is, per research, a novel approach that can be easily accomplished using free and readily available software such as ImageJ. This presentation will discuss the following: (1) the steps to import and/or create an image series to generate a z-projection; (2) considerations regarding anatomical planes from a CT series in order to generate appropriate postmortem radiographs for comparison; (3) two examples of z-projection used to identify a decedent; (4) the value of generating z-projections for missing persons in NamUs to possibly aid in the identification of unidentified individuals; and, (5) future research using the projection of antemortem CT series for identification purposes. Implementation of software to create projected images from an antemortem CT series will provide forensic anthropologists, radiologists, and pathologists another avenue for the positive identification of remains.

**Forensic Radiology, Positive Identification, CT Scan Project**



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