A49 The New Method of Implementing 3D Scanners and X-Rays on Commingled Remains Recovered From a Korean War Recovery Site

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After attending this presentation, attendees will better understand how to approach the new method of implementing 3D scanners and X-rays in the calculation of Minimum Number of Individuals (MNI) for commingled remains.

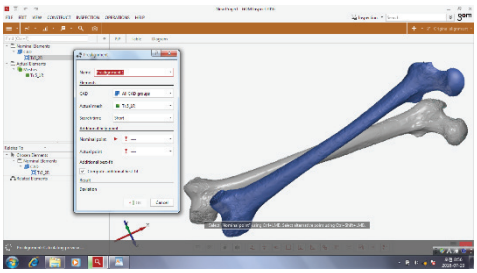
This presentation will impact the forensic science community by providing information on the challenges faced when calculating MNI for commingled remains in mass burial cases.

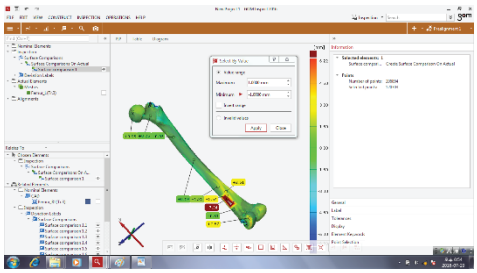
The pair-matching method has been a useful means of identifying each individual from commingled remains. Until this point, physical and metrical (osteometric sorting) analyses were commonly used for pair matching; however, both methods face certain limitations. As physical analysis is subjective in nature, results may differ depending on anthropologists' personal experiences. With metrical analysis, there may be difficulties in applying this method when the bones are either impaired or damaged.

This study will review the effectiveness of employing 3D scanners and X-ray images as part of pair matching to minimize the limitations faced by the more traditional methods. In this study, samples were collected by the Ministry of National Defense (MND) Agency for KIA Recovery and Identification (MAKRI) as a part of their mission to recover Korean War remains in Gum riverside in Junla province, Republic of Korea. The MNI calculation for the physical and metrical analyses of commingled remains recovered was 41 individuals; however, 49 individuals were identified through DNA analysis. The eight individuals who could not be matched using the traditional pair-matching methods were 3D scanned and X-rayed.

Once 3D scanning was completed, an analytic program was used to produce mirror images of the bone elements and compared: (1) to the same bone element of different individuals; (2) to the left and right bone elements of different individuals; and, (3) to the left and right bone elements of the same individual for the degree of superimposition, then deviation was calculated.

To compare the same bone element of different individuals through bone marrow cavity of extent and width, thickness of compact bone, and bone curvature and angle, the bone elements were X-rayed in anterior to posterior and lateral directions.





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Through 3D scanning and X-ray analysis, five out of the eight individuals were pair matched, which could not be accomplished using only the physical and metrical analyses. Based on these results, it is possible to infer that X-ray and 3D scanners, when used in combination with the traditional methods such as physical or metrical analysis methods, are effective enough to enhance the accuracy from 84% to 94%. The mirroring technique of the 3D analysis method is especially effective in inferring or confirming the degree of superimposition on damaged or impaired bones, which cannot be seen by physical or metrical analysis methods. X-ray provides valuable information that cannot be gained by superficial examination as it allows for a comprehensive evaluation of internal structures of bone elements. Thus, using 3D scanners and X-ray with pair matching is highly recommended; however, it is necessary to collect additional samples in further studies to truly understand its effectiveness. In addition, the possibility of implementing Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) in pair matching commingled remains should also be considered.

This presentation will discuss the effectiveness of the use of 3D scanners and X-ray in pair matching commingled remains.

Commingled Remains, 3D, Mass Burial