H81 The Mastoid Sinuses and Their Potential in Comparative Radiology for Forensic Anthropology

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After attending this presentation, attendees will gain an appreciation for establishing new and useful quantitative techniques in regards to human identification; specifically to comparative radiography of the mastoid sinuses.

This presentation will impact the forensic community and/or humanity by instilling the idea that mastoid sinuses are a practically untouched resource in widening the methods utilized for human identification.

Mastoid sinuses are an untouched resource in forensic anthropology and comparative radiology. These sinuses are presently used to aid in making a positive human identification by comparing an ante-mortem x- ray and a post-mortem x-ray. This method is trustworthy on a qualitative level but should be further pursued to enable the forensic community the ability to quantitatively compare the mastoid sinuses in relation to human identification.

This project's purpose was to look at computed tomography scans (CT) of 25 males and 27 females in the computer system they were originated from to establish a measuring technique. A quantitative system was created to measure mastoid sinuses in ante-mortem and post-mortem CT scans and means of establishing positive identification. This measuring system would show extreme variability between individuals or between males and females therein turn creating Mastoid sinuses were decided upon due to their consistency throughout life after the age of twenty, they do not alter unless afflicted by disease, their vast complexity which allows for greater amounts of research and comparison, and the fact that they are housed within one of the strongest bony areas of the body, allowing the mastoid sinuses to survive extreme situations during peri- mortem events.

The CT scans of fifty-two individuals were first examined to determine if there was a way using the Seimens Computer program in the CT scanner to measure mastoid sinuses. After testing five individuals it was determined that a particular slice of two views (coronal and axial) of a CT scan would need to be established as the measuring spots for each individual tested. These views, or slices, were established by looking at a complete set of scans for the five individuals and determining that there were anatomical landmarks in each person's set of scans that were consistent. These landmarks were chosen enabling consistent slices for each individual measured in the entire project. Once these landmark slices were established a measuring system needed to be developed.

The computer program used in this project the user to make the mouse of the computer a measuring tool for irregular shapes. This enabled the users to trace with the mouse curser the outline of each mastoid sinus, giving the area measurement. Then the user measured the length and width within the area measured around the sinus. Each measurement was taken three times, twice by the author and once by the associate researcher. Once these measurements were all gathered, they were entered into a database that was compatible with the statistics program SPSS. Descriptive statistics were utilized to demonstrate the range of measurements obtained, the ages within the sample and the differences between sexes. Initially, the author wanted to statistically compare each individual to one another to show the statistical variability between since there were no previous mastoid measurements or research exactly like this to compare against the currently gathered measurements this was not accomplished. The author then took all of the measurements and compared the largest measurement to the smallest demonstrating that there are statistically significant differences among the overall range of individuals. This test only allows the author to show the wide range of measurements and that each individual has their own area with length and width, but not that they are significantly different measurements. This project also statistically compared the male area measurements to the female area measurements to establish if there were any statistically significant differences in measurements between sexes. Testing was also done on the correlation between various measurements. These tests were run to establish what relationships were likely and how often they may occur, enabling the researcher to expect certain results in future measurements. Inter-observer error was tested as was intra-observer error to establish if the measurement technique used was reliable.

Results indicated that the age range in this project was wide; 20 to 95 years of age. Descriptive statistics indicated that every individual had a unique area measurement. There was low correlation between age and sex indicating that age and sex did not affect the area measurement. There was a high

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correlation between area measurements of the right and left sides of the individual, indicating that development rates are similar and do not vary a great deal after full development of the sinuses. Lastly, length and width were highly correlated area as would be expected due to anatomical consistency between the left and right sides. Overall, this project was able to demonstrate that the recording method established did show the variability between the mastoid sinuses between individuals, but leaves room for future research. This project did not establish a consistent and useable measuring system for use in daily practice but did establish that there is high correlation between certain measurements and that if a better measuring tool is utilized, a more consistent and useable measuring system may be established to aid in making positive identification for human remains.

Comparative Radiology, Human Identification, Mastoid Sinuses

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