H30   The Reliability of Visually Comparing Small Frontal Sinuses

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The goal of this presentation is to provide attendees with information about the reliability and validity of visually comparing and correctly matching small, less-featured frontal sinus outlines as seen in radiographs.

This presentation will impact the forensic community by further emphasizing the reliability of personal identification through matching frontal sinus radiographs.

Several studies have investigated frontal sinus comparison for personal identification. Many of these studies, however, involved small sample sizes both in terms of the number of radiographs examined and the number of participants. One study addressed the statistical reliability of correct identification using Elliptic Fourier Analysis and Euclidean distance models on digitized images which resulted in a 96% accuracy rate. The remaining 4% largely represents the inability of the computerized models to correctly match small, less-featured frontal sinuses.[1] The present study investigates the hypothesis that human examiners will be able to more accurately identify correct matches both because of the discriminating ability of the human eye as well as the potential to take other features of the radiograph image into consideration.

Radiographs were obtained from the University of Tennessee and represent specimens from the William M. Bass Donated Skeletal Collection taken as part of a previous study. A random sample of 60 pairs of radiographs was selected from the collection. From these 60, the radiographs with the smallest frontal sinuses and lacking visible dental restorations were used for this study, thus creating a sample specifically aimed at making the matching process as difficult as possible.

Participants of varying backgrounds and levels of experience were solicited to participate in the study including Federal Bureau of Investigation scientists and attendees of the 2008 annual meeting of the American Academy of Forensic Sciences in Washington, D.C. Participants were provided two sets of 28 radiographs labeled A through BB and 1 through 28, an answer sheet, and a light box. They were advised that matches consisted of one letter or letter combination plus one number, and that not all radiographs necessarily had a corresponding match present.

Participants were also asked to provide information regarding their education and background. Further, they were asked to rate their level of experience in both examining radiographs and performing anthropological or skeletal examinations. Finally, participants were asked to list any characteristics besides the frontal sinuses that they used to determine matches.

The exercise contained 26 matched pairs and four radiographs that did not have a match. Overall, error rates were very low. False negative associations were significantly more common than false positive associations and errors generally occurred less frequently among participants with more experience. Of note is the fact that one particular association appeared to be the most difficult to identify and was missed most frequently. Most participants reported using features in the radiographs in addition to the frontal sinuses to make identifications.

Results support previous assertions that frontal sinus radiographs are a reliable means of personal identification. Moreover, while previous studies have statistically evaluated the technique's reliability using computerized models, the results of this study indicate that traditional visual comparison fares exceptionally well, even when frontal sinus projections are small.

Reference:
[1] Christensen AM. Testing the reliability of frontal sinus outlines in personal identification. J Forensic Sci 2005;50(1):18-22.
Forensic Anthropology, Frontal Sinus, Personal Identification