A9 Visual Analysis of Maxillary Sinus Variability for Identification of Unknown Decedents

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After attending this presentation, attendees will gain an understanding of a method of decedent identification using comparison of the maxillary sinus region of antemortem and postmortem panoramic dental radiographs.

This presentation will impact the forensic science community by providing forensic professionals with an additional method of making a positive identification of an unknown individual.

Positive identification of unknown decedents is of great importance in any investigation. This process is often made difficult by a lack of antemortem records for comparison. A variety of positive identification methods using radiographic comparison of various anatomical structures have been extensively studied to combat this limitation, but many of these methods focus on comparisons of radiographs that are not common in antemortem records and can only be used in isolated cases. Standard dental radiographs are commonly used to make positive identifications of unknown remains because of their availability in antemortem records, but these identifications focus on the dentition of the individual. In recent years, panoramic dental radiographs, which allow for the examination of both dentition and a large portion of the maxillary and mandibular regions, have been commonly included in the standard dental exam. Along with providing a more global view of the dentition, panoramic radiography also provides a clear view of the maxillary sinus region. Several pilot studies suggest that panoramic dental radiographs could be used to compare a number of anatomical structures within the facial region of the cranium if dental identification was not successful; however, the use of these structures in the positive identification process has not been fully researched.

The purpose of this study was to examine the maxillary region of a known sample of pairs of panoramic radiographs from seven individuals, looking specifically at the maxillary sinus region visible on the radiographs for both congruency and corresponding unique traits between the pairs of radiographs. This sinus region was chosen due to the previous success of studies on positive identification using radiographs of the frontal sinuses and maxillary sinuses. To examine this, the dentition was cropped out of each radiograph, and an online survey was created that showed radiographs one at a time and allowed for the selection of a match for the radiograph from a group of four possible radiographs. Forty-nine participants completed both the radiograph matching survey and a brief questionnaire noting qualifications and level of experience.

The results indicated that the maxillary region of panoramic radiographs can be matched with an average of 80% accuracy, indicating moderate success in positive identification. Accuracy for matching the radiographs was not significantly higher for the participants with more experience. In examination of the sinus area, four anatomical structures were most associated with being diagnostic of a positive match: (1) the laterobasal border of the nasal cavity; (2) the inferior nasal conchae; (3) the borders of the eye orbits; and, (4) the maxillary sinuses. These results indicate that the maxillary region of panoramic dental radiographs has the potential to be used for positive identification purposes in the field of forensic anthropology and should be pursued further due to high inclusion of panoramic radiographs in the antemortem record. Future studies will further evaluate this region with both geometric shape analyses and visual matching assessments.

Maxillary Sinuses, Positive Identification, Radiograph Comparison