A17 Reassociating Commingled Human Crania With First Cervical Vertebrae: An Osteometric Approach

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Learning Overview: After attending this presentation, attendees will understand the importance of using osteometric methods in sorting commingled human remains.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a statistically valid method of sorting skeletal remains from commingled assemblages, which can be supplementary to the traditional non-metric methods.

The sorting of human remains is crucial in situations where commingled remains are encountered, such as in mass disasters.[1] The cranium and first cervical vertebra are often found in commingled contexts. As the cranium is an anatomical region used for sex and age estimation, it is important to be attributed to an individual. The goal of this study is to provide a solid statistical method for reassociating commingled human crania with atlases using measurements taken from both skeletal elements.

For this purpose, the maximum bicondylar breadth, the maximum internal length and width of the foramen magnum, and the maximum length of the occipital condyles along their long axis were measured from 159 crania of the Athens Collection.[2] In addition, the maximum length and width of the vertebral foramen, the maximum length of the superior facets, and the maximum distance between the lateral edges of the superior facets were also taken.[3] The individuals included in this skeletal collection are of known sex, age, occupation, and cause of death. All specimens examined lived during the second half of the 20th century in Athens, Greece. The age of this sample ranged between 18 and 99 years.

Simple linear regression analysis produced a number of equations for reassociating the cranium with the atlas of the same individual using the aforementioned measurements. A total of five equations were appointed as the best statistical models for predicting measurements of one skeletal element using measurements of another. The chosen measurements presented a significantly strong correlation, with Pearson's correlation coefficient (r) ranging from 0.73 to 0.88 (p<0.05). The coefficient of determination (r^2) of the five models had a range of 0.56-0.77. The Standard Error of the Estimate (SEE) was between 1.26 and 2.15.

In conclusion, it is strongly believed that the regression models of this study are considered capable of matching the cranium and the atlas in a commingled assemblage. Further research on the application of the above method is recommended.

Reference(s):

1. Ubelaker D.H. Methodology in Commingling Analysis: A Historical Overview. In: Adams B.J., Byrd J.E., editors. *Recovery, Analysis and Identification of Commingled Human Remains.* Totowa, NJ: Humana Press; 2008; 1–6.
2. Holland T.D. Sex Determination of Fragmentary Crania by Analysis of the Cranial Base. *American Journal of Physical Anthropology*. 1986; 70(2):203–208.
3. Marino E.A. Sex Estimation Using the First Cervical Vertebra. *American Journal of Physical Anthropology*. 1995; 97(2):127–133.

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