A75 Skeletal Sex Assessment Utilizing the Fifth Lumbar Vertebra

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The goal of this presentation is to explore the levels of sexual dimorphism found in the fifth lumbar vertebra and to specifically examine the utility of 11 linear measurements taken from an American sample of vertebra for sex assessment.

This presentation will impact the forensic science community by increasing the range of skeletal elements that can be utilized for determining the metrics for sex estimation and by beginning to explore the potential differences in levels of sexual dimorphism between vertebra and populations.

Sex estimation is a vital part of any investigation of unidentified human remains as it narrows the pool of potential victims. While well-accepted methods of sex estimation for the cranium and many postcranial elements exist, levels of sexual dimorphism have not been established in all skeletal elements; however, this is becoming vitally important in cases where remains may be fragmentary or incomplete and many heavily relied-upon methods may fail.

Over the last two decades, research has been pursued in exploring sexual dimorphism in select vertebra from a variety of populations.[1-3] These studies have resulted in varying levels of success, with overall sex estimation accuracies of approximately 85%. Of the three previously cited studies, two examined vertebra below the level of the sixth thoracic, both using data collected from Computed Tomography (CT) scans on East Asian populations.[2,3] Though their results show promise, the applicability of these methods to measurements taken on dry bone from external populations needs validation.

The present study examined 11 linear measurements from 160 fifth lumbar vertebra housed in the Hamann-Todd Collection at the Cleveland Museum of Natural History in Cleveland, OH. Of the 160 individuals, 41 are documented as White males, 39 as White females, 39 as Black males, and 41 as Black females. Individuals in the sample were between the ages of 16 and 93 years old. The measurements include maximum dimensions of the vertebral body, pedicle widths, maximum widths of articular processes, transverse processes, and length of the spinous process. Statistical methods including discriminant function analysis and principal components analysis were run on the collected measurements to examine the level of sexual dimorphism in the sample.

Of the measured vertebral dimensions, anterior posterior dimensions of the vertebral body are the most dimorphic from this sample. Classification accuracies were found to be 78% and 77% for American Blacks and American Whites, respectively. Cross-validated sex estimation accuracies using discriminant functions increased this accuracy by only one to two percentage points when ancestries were pooled. These results are much lower than those reported in studies using Korean and Chinese CT populations. This could be for any number of reasons, all of which require further investigation. These include differences in measurement technique from 3D CT to dry bone, differences in population sexual dimorphism, and differences in vertebral level sexual dimorphism.

References:

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Anthropology, Vertebra, Sex Assessment