H98 The Potential of the Angle of the First Rib, Head to Tubercle, in Sexing Adult Individuals in Forensic Contexts

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After attending this presentation, attendees will understand the potential application of using the angle of the first rib, head to tubercle, in the successful sexing of unknown individuals, the calculation of the angle of the first rib and the statistical probability of correctly sexing an individual using the angle.

This presentation will impact the forensic science community by providing another tool for sexing unknown individuals using skeletal material, which can aid in identification.

Accurately assessing the sex of an adult human skeleton is fundamental in forming the biological profile used in forensic anthropology. The first rib was chosen due to its distinct shape, compact size and increased sustainability to taphonomic processes. The first rib has been examined in past research, but all focus has been on the sternal end of the rib and none on the angle created between the tubercle and head. This angle is present when the rib is viewed in its non-anatomical orientation. In some cases the angle is not present and the anatomical positioning is necessary to determine the siding for a rib with an angle of 0^{o}. When a rib is sided in anatomical position the head will, in most cases, point downward and the subclavian grooves will be on the inferior surface.

This study was conducted using males and females, both African and European American, from the William M. Bass and Hamann-Todd Skeletal Collections. The left and right first ribs of 286 individuals were measured for total length, internal length, height of head off of a surface and length from tubercle to head. The angle was determined using a sliding caliper to measure the length from the head to the tubercle and the head to a surface, and then calculating the inverse sine to obtain the angle from the measured hypotenuse and height.

The calculated angles were then compared using logistic regression analysis, to determine the likelihood that a given angle was either male or female. Of the 572 measured samples, 555 were calculated, 17 were excluded for missing angle or length measurements, with 266 angles being male and 289 female. Logistic regression showed that angle alone is 60.2% concordant, while angle, total length and internal length combine to yield a 70.5% concordance. These results suggest that the angle can be used to predict sex of an individual, while the addition of total rib length and internal rib length increase correct classification by 10%.

This research shows that the angle of the first rib is able to determine the sex of an individual with a high statistical probability, using several measurements of the bone that are likely to survive prolonged taphonomic exposure. The probable sex information could be combined with aging methods of the first rib to assess both age and sex of an unknown individual. Since few skeletal elements can both age and sex an individual, this research could have great potential for further forensic applications in adding reference information to the field.

First Rib, Sexing, Identification

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