



Physical Anthropology Section - 2013

H46 **Asymmetry of the Humerus: The Influence of Handedness on the Deltoid Tuberosity and Possible Implications for Osteometric Sorting**

Carrie B. LeGarde, MA*, 974 Auloa Rd, Kailua, HI 96734; and John E. Byrd, PhD, 95-033 Hokuiwa St, #51, Mililani, HI 96853-5530

After attending this presentation, attendees will have gained an understanding of how individual asymmetry may affect the sorting of humeri in a commingled assemblage and the possible correlation between this asymmetry and an individual's handedness.

This presentation will impact the forensic science community by illustrating which measurements may be most related to hand preference and whether this could adversely affect the osteometric sorting method for pair-matching.

The identification of individuals from commingled human remains can be a difficult task. Osteometric sorting is often utilized for these purposes since it sorts remains based on size. This research investigates whether asymmetry of the humerus is present, if it is due to an individual's hand preference, and if this asymmetry can cause incorrect sorting of elements when utilizing the osteometric sorting method for pair-matching.

The osteometric sorting formulas for pair-matching were used to classify individuals as asymmetric. This method utilizes a *p*-value to determine whether a significant difference in size between left and right elements exists. A *p*-value less than 0.10 indicated that two elements were significantly different, and therefore, deemed to be asymmetrical. Significant asymmetry was seen in multiple measurements and this asymmetry could be due to handedness. This relationship appeared more consistent with breadth measurements than length measurements, and the right side appeared to be larger more often. The epicondylar breadth of the humerus was the most asymmetric with 12.8% of individuals considered asymmetric. All breadth-only measurements of the humerus resulted in over 12% asymmetric. Asymmetry of the maximum length of the humerus occurred in only 7.3% of individuals. When breadth measurements were combined with the maximum length of the humerus, the number of the asymmetrical individuals was reduced to less than 9%. These results did not appear to correlate with the results seen on the radius. Maximum length of the radius was slightly more asymmetric than the maximum diameter of the radial tuberosity, 9.9% and 8.3%, respectively. Less than 20% were considered asymmetrical for both the radius and humerus. This indicates that asymmetry in the arm and forearm is not related.

The femur yielded results indicating asymmetry between left and right, but these results were not significant (only 6% of individuals). The mean difference of the maximum length of the femur between left and right elements was 1mm, which is incredibly small for a measurement that is generally at least 400mm.

When investigating male and female differences of the humerus, a notable difference was found. The range of the difference between left and right elements was greater for males than for females for both maximum length of the humerus (28.00mm and 11.50mm) and the maximum diameter at the deltoid tuberosity (7.6 mm and 2.67mm). The osteometric sorting method uses the variation in the data set to determine whether the difference between two paired elements is significant or not. When females are included in the data set with males, the difference between paired elements is not significant, but when analyzed alone, they are. This suggests that, in general, males have a greater difference between left and right humeri than females.

Asymmetry is present in the upper limbs. A significant difference in size between the left and right humeri and radii was seen. However, particular measurements were more asymmetrical than others. Breadth measurements were asymmetrical more often than length measurements. This asymmetry may be due to an individual's hand preference. Further investigation is necessary. No correlation was found between asymmetry of the humerus and asymmetry of the radius. This suggests that mechanical forces may act differently on the upper limb than the lower limb. These results indicate that anthropologists utilizing the osteometric sorting method should be aware of measurements that tend to reflect asymmetry.

Asymmetry, Humerus, Osteometric Sorting