H39 Femoral Variation Between Whites and American Indians

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This discussion will present to the physical and forensic anthropological community a detailed study of three areas of the femur which demonstrate significant variation between two populations, U.S. Whites and American Indians, and which show promise in distinguishing these populations in a forensic context.

The femur has long been studied in physical anthropology, and notable differences have been found between major human populations. Studies at the University of Wyoming have focused primarily on morphological differences noted between whites and American Indians. The current study expands on three such studies, and provides a way to quantify these differences. This study compares the means of these populations in three areas: femoral torsion, platymeria, and intercondylar notch height. Statistical analyses were run to test the hypothesis that in each of these areas independently no significant variation exists.

Torsion height is a single measurement taken with standard sliding calipers, where the maximum height of the femur head is measured from the surface upon which it is resting, with both condyles lying flat on the surface. Differences between American Indian femora and those of whites have been noted in the degree of torsion, with American Indians evidencing higher torsion. Statistical analyses from the current sample have supported this observation, and noted that the difference is quite significant. At the extremes of the populations, racial discrimination in a forensic context can be obtained with a high degree of certainty from this trait alone.

Femoral platymeria has been shown to be another trait useful in distinguishing individuals from these populations, with American Indian femora exhibiting a much higher degree of platymeria, or flatness, of the proximal femur. Platymeria is obtained through two standard measurements of the femur, anterior-posterior (A-P) and medial-lateral (M-L) subtrochanteric diameter. Together these measurements quantify the observed morphology of the proximal end of the femur in cross-section; whites tend to be more circular in cross-section, with similar values of both A-P and M-L, while American Indian femora exhibit a flatness of the femur, with a smaller A-P diameter. Statistical analyses of these populations in the current study again show that there is a significant difference in this trait, and that it is another trait which can be extremely useful in distinguishing femora from these populations.

Finally, variations in the intercondylar notch height of the distal femur were compared between the two populations. Intercondylar notch (ICN) height is another single measurement taken of the maximum height, wherever found, of the ICN from the surface upon which the bone is resting, in the same position as with torsion height. Statistical analysis demonstrated that there is a significant difference between the means of the two populations, with whites exhibiting a higher ICN height. With this trait alone, femora of these populations can be distinguished with a high degree of certainty at the extremes of each population.

This study has been conducted in an attempt to explore and quantify variations between the femora of whites and American Indians, and has its most value, perhaps, in a forensic context to help in the identification of individual unknown skeletal remains from these populations. Each area of the femur explored here has shown variation between these populations which has proven to be statistically significant. This study lends credibility to the observed morphological differences which have been noted in the past, and quantifies how valuable are these techniques of racial differentiation by use of the femur.

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