A117 Testing the Accuracy of the Correlation Between the Condyles of the Distal Femur and Proximal Tibia: A Validation Study

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After attending this presentation, attendees will have an appreciation for the accuracy of predictive formulas correlating the distal femur and proximal tibia and the potential for this method to be used in mass fatality and/or commingled remains cases.

This presentation will impact the forensic science community by revisiting predictive formulas constructed by Waxenbaum and Linney and tests the accuracy and practicality of this methodology's use in the field on a novel sample.[1]

The knee is one of the most functionally important and largest joints in the body, prompting several researchers to explore sex and ancestral variation in the femur and tibia.[2-5] Assessing the relationship between distal femur and proximal tibia could prove itself useful when attempting to resolve commingled remains scenarios, including mass disasters, human rights violations, and archaeological assemblages, making this relationship both forensically and bioarchaeologically significant.[6,7] Not only do the distal femur and proximal tibia consistently preserve well, but the knee is also one of the last areas to burn when introduced to fire.[8] Due to the consistently strong survival rate of the knee in archaeological, mass disaster, and fatal fire scenarios, the distal femur and proximal tibia are a critical area that requires a more thorough anthropological examination. In 2011, Waxenbaum and Linney constructed predictive formulas, both general and specific to age, sex, and ancestry, on both a modern and archaeological sample through reduced major axis regression.[1] The present research will test the applicability of these equations on a novel sample.

Data were collected on a sex- and population-balanced sample of 103 individuals from the Hamann-Todd Collection housed at the Cleveland Museum of Natural History. Measurements of the left medial and lateral epi/condyles of the distal femur and proximal tibia were taken on all individuals and compared through analysis of variance and covariance as well as reduced major axis regression. The measurements were recorded using a digital sliding caliper and measured to the nearest +/- one millimeter. The effects of interobserver error to determine repeatability was also performed.

All analyses proved the equations to be accurate, yet not very precise. Interobserver error is likely too high for practical use. The medial condyle equations performed best for historic samples, while the potential for the use of the lateral condyle equations on modern samples needs further exploration. In the end, the pooled equations would be the only ones ever used in the field or laboratory. Despite the accuracy, unfortunately, the equations used in commingling situations is unrealistic.

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