A32   Femoral Neck Axis Length (FNAL): Use in Sex and Ancestry Estimation of Hispanic Populations

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After attending this presentation, attendees will be familiar with the FNAL measurement as well as how FNAL can now be used to estimate sex from skeletal remains in Hispanic populations.

This presentation will impact the forensic science community by expanding the use of the FNAL method in sex determination for Hispanic populations. This method will facilitate the identification process for deceased immigrants of Hispanic ancestry on the United States southern border.

Since 1998, the bodies of more than 6,300 deceased undocumented immigrants have been discovered along the United States-Mexico border.[1] The majority of these individuals are of Hispanic ancestry. Traditional sexing methods, using standards developed from skeletal collections of American Whites and American Blacks, do not accurately sex those of Hispanic ancestry. In fact, 53% of Hispanic males are misclassified as females using these standards.[2]

Recent studies examining FNAL defined the measurement as the distance from the base of the greater trochanter (the point directly inferior to the greatest lateral projection of the greater trochanter) to the apex of the femoral head, excluding any lipping on the fovea capitus femoris.[3,4] Meeusen measured the FNAL from skeletonized remains of American Black, American White, and Native American samples of both sexes and showed that the FNAL measurement classified ancestry with low accuracy rates, ranging from 41.6% to 48.5%, and classified sex with high accuracy rates, ranging from 84.5% to 87.0%.[4]

In this study, the FNAL measurement was examined to determine its potential use for sex and ancestry estimation of Hispanic populations. FNAL was measured on skeletally mature adults, void of visible anomalies potentially affecting the measurement. Data was collected from Undocumented Border Crosser (UBC) cases recovered from Falfurrias, TX, (*n*=58: F=21, M=37) by the Reuniting Families Project. These data were then compared with the data from Meeusen: 87 (F=32, M=55) American Black; 108 (F=54, M=54) American White; and 91 (F=44, M=47) Native American individuals.

Statistical analyses were conducted in SPSS and included one-way Analysis of Variance (ANOVA), stepwise Discriminant Function Analyses (DFA), cross-validated sectioning point classification rates, and Bayesian analyses. In addition, a random subset of 55 femora was measured in a second trial for the purpose of intra-observer error assessment. Results showed low intra-observer error, with a Technical Error of Measurement (TEM) of 0.32mm and a coefficient of Reliability (R) of 0.99. A random subset of nine femora was also measured in a second trial for the purpose of inter-observer error assessment. Results showed low inter-observer error, with a TEM of 0.53mm and a R of 0.99, confirming previous repeatability assessments of the measurement.

One-way ANOVA revealed significant differences in FNAL between ancestral groups, with American Whites having the largest FNAL, followed by American Blacks, UBCs, and then Native Americans. Post-hoc Tukey HSD comparisons showed that American White FNALs are not significantly different from American Black FNALs (P=0.881), and UBC FNALs are not significantly different from Native American FNALs (P=0.998). DFAs classified samples by ancestry poorly, with accuracy rates ranging from 34.7% to 40.4%.

One-way ANOVA results also showed significant differences in FNAL between sexes, with male FNALs being significantly larger than female FNALs (P <0.001). DFAs classified samples by sex well, with accuracy rates ranging from 83.4% (ancestry-pooled) to 91.4% (UBC only). The UBC sectioning point, calculated at 87.5mm, provides a classification accuracy of 90.5% for females and 89.2% males.

The FNAL measurement has not been previously applied to Hispanic populations for either sex or ancestry estimation. Using FNAL measured from skeletonized femora, the 87.5mm UBC sectioning point correctly predicts sex at a rate of ~90%. Due to the skeletal variability seen in UBCs and their unidentified status, this sample provides only preliminary information about Hispanic populations. Further collection and analysis of Hispanic skeletal remains is encouraged.

    Presenting Author