A23　　A Test of Wright and Vasquez on an American Population

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After attending this presentation, attendees will understand the applicability of the Wright and Vasquez equations for estimating maximum length of a long bone from fragmentary remains on an American sample.[1]

This presentation will impact the forensic science community by providing another possible means of estimating maximum length of the tibia and fibula from fragmentary remains for the purpose of stature estimation on an American sample.

Obtaining a stature estimate is difficult when dealing with fragmentary remains since stature estimation models are most successful when maximum length measurements are utilized. Multiple studies have produced equations that estimate the maximum length of a long bone based on measurements of fragments or bone segments, which can then be used in stature estimation models. Currently, there are no methods for estimating maximum length of the fibula from fragments for an American population. Wright and Vasquez produced estimation equations for the fibula based on a Guatemalan sample, but suggested that before applying their equations to a different population, the equations should be validated on complete long bones from the population in question.[1] In response, this study utilizes measurements from the tibiae and fibulae of 19 American Korean War soldiers to test the applicability of Wright's and Vasquez's equations on an American population.

The regression equations using fibular segments produced by Wright and Vasquez were used to calculate the estimated maximum length of the fibula and tibia.[1] The estimated maximum lengths were then compared to the actual maximum length of the elements. When Wright and Vasquez tested their equations on a known Guatemalan population, the equations for estimating tibial length from segments of the fibula actually performed better than the equations utilizing segments of the tibia. For this reason, regression equations for segments of the tibia were also used to investigate if, indeed, the fragmented fibula is more reliable than the fragmented tibia for estimating maximum length of the tibia on an American sample as well.

This study shows that the Wright and Vasquez equations perform well on an American population. Following the procedure Wright and Vasquez used for testing their equations, the mean difference between estimated and actual maximum lengths was calculated, as well as Mean Absolute Deviation (MAD) and Mean Squared Error (MSE).[1] The probability for a paired t-test between estimated and measured lengths for each equation was also calculated. Wright and Vasquez considered only $p<0.001$ to indicate significant differences between the estimated and actual lengths.[1]

No tibial or fibular length estimates using the regression equations differed significantly from the actual maximum lengths as evidenced by no p values less than 0.001. The mean difference was 2mm or less for the majority of the equations. The equations with the greatest mean difference were the equations estimating tibial length from fibula segments, ranging from 2mm to 5.36mm. Overall, the MAD was relatively small for all equations and it was less than the standard error of the estimating equations in all cases. The tibial length was underestimated in all equations, reflected by a negative mean difference. The maximum length of the fibula was overestimated for two of the three equations. Estimating the maximum length of the tibia from incomplete fibulae did not perform as well as using tibial segments, but they still performed adequately.

The results of this analysis are promising for the applicability of this method on non-Guatemalan remains. Although the sample size is small, this study suggests that Wright's and Vasquez's equations for estimating maximum length of the tibia and fibula from fragmentary remains can be used on an American population.

Reference:

　1.　Wright LE, Vasquez MA. 2003. Estimating the length of incomplete long bones: Forensic standards from Guatemala. *AJPA* 120:233-251.

Fragmentary Remains, Stature, Fibula