A13 A Statistical Method for Reassociating Human Tali and Calcanei From a Commingled Context

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After attending this presentation, attendees will understand the utility of using metric methods for sorting commingled human remains.

This presentation will impact the forensic science community by presenting a statistically valid means of sorting commingled remains when traditional non-metric methods need to be supplemented.

Compact human bones are highly resistant to taphonomic change and are usually found intact in the field.[1] The two largest tarsal bones, talus and calcaneus, are frequently recovered intact and in high abundance. In a commingled context, assessing that a talus and a calcaneus correspond to the same individual could become the primary step for accurately sorting human remains. In this framework, the present study seeks to develop a more accurate method for sorting an individual's talus and calcaneus by using measurements of these bones' joint surfaces.

For this purpose, the lengths and widths of the trochlea, posterior calcaneal articular surface, and posterior talar articular surface were measured in 197 individuals (105 males, 92 females) of the Athens Collection.[2,3] This skeletal collection consists of individuals of known sex, age, occupation, and cause of death. All specimens examined lived in the second half of the 20th century in Athens, Greece. Their biological age ranged between 22 and 99 years. The degree of significant correlation among measurements was calculated using the Pearson's correlation coefficient. Simple and multiple regression analyses were performed for the development of functions for reassociating an individual's talus with its corresponding calcaneus.

Simple and multiple linear regression analyses produced a total of 12 equations (six for each side) as the best statistical models for predicting measurements of the calcaneus using measurements of the talus. The standard error of the estimate ranged between 1.03mm and 2.02mm. Pearson's correlation analyses demonstrated statistically significant strong positive correlations among measurements (0.69-0.93, $p<0.05$). The coefficient of determination (r^2) scored overall higher in multiple regression analyses (0.72-0.87) compared to simple regression analyses (0.48-0.86).

In conclusion, the regression equations developed in this study are found to be suitable for sorting commingled human tali and calcanei. Future development of similar methods for other joints of the human skeleton would be beneficial for the anthropological analysis of commingled remains.

Reference(s):

1. Lyman R.L. *Vertebrate taphonomy.* New York: Cambridge University Press, 1994.
2. Martin R., Knußmann R. Anthropologie: handbuch der vergleichenden biologie des menschen. Stuttgart: Gustav Fischer, 1988.
3. Martin R., Saller K. *Lehrbuch der anthropologie.* Stuttgart: Gustav Fisher, 1959.

Commingled Remains, Talus, Calcaneus

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