## A66 Comparative Study of Human and Non-Human Long Bones by Anatomical and Radiological Methods

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After attending this presentation, attendees will better understand how human and non-human long bones differ when compared using some specific anatomic and radiological measurements, especially when only the mid-shaft of the bone is available, which is very difficult to identify.

This presentation will impact the forensic science community by providing new parameters and statically significant results from a comparative cross-sectional study in an area in which limited research is performed and will add to research being performed in forensic anthropology and forensic pathology by widening the prevalent view of the differences as well as use of new parameters for differentiating the mid-shaft region of long bones of human and non-human origin.

With skeletal remains, the first step is to determine whether or not the object in question is actually bone, and if so, then whether or not it is human. Many organic and inorganic materials can mimic bone (e.g., wood, stones, etc.)[1] When bones are incomplete or fragmentary, problems escalate rapidly. Cylindrical segments of the central shaft have little in the way of distinguishing features, apart from size. Burnt bone fragments offer similar problems due to heat distortion and shrinkage.[2] False samples of bones could be incorporated and claimed to be of human origin. Such cases lead to medicolegal complications such as whether the bones found could be linked to murder.

In this study, 30 human long bones of upper and lower limbs and 30 corresponding bones of *Capra aegagrus hircus* (goat) and *Ovis aries* (sheep) were used. This study was conducted at the Department of Forensic Medicine, at a tertiary care hospital in New Delhi after receiving ethical clearance. The continuous variables were compared in two groups by independent *t*-test and Wilcoxon rank sum test. Categorical variables were compared in two groups by using chi-square test and Fischer's exact test. The $p$ value $<0.05$ was taken to be statistically significant.

The comparison of cortical thickness and ratio of cortical thickness to total diameter was statically significant when the group comparison was performed, which agrees with Croker et al.[3] But, when individual human bones were compared with non-human bones as a group, femur ($p$=0.39), fibula ($p$=0.45), humerus ($p$=0.57), and radius and ulna ($p$=0.34) showed no significant results for cortical thickness to total diameter ratio. When compared to the non-human counterpart, tibia ($p$=0.5) and fibula ($p$=0.22) showed no significant results. The mean ± Standard Deviation (SD) values for cortical thickness in this study for the human group was 5.36 ± 2.40 and for the non-human group was 2.89 ± 0.87 ($p<0.05$). In this study, the cortical thickness for the tibia in the mid-diaphyseal region had a median value of 8.87mm, similar to the findings obtained by Croker.[4] When compared with animal counterparts, cortical thickness to total diameter ratio was statically significant for the radius ($p<0.05$) and ulna ($p<0.05$) but was non-significant for the femur ($p$=0.39), tibia ($p$=0.5), humerus ($p$=0.57), and fibula ($p$=0.45). The median for human femur bones was 0.271 and for non-human bones was 0.198 ($p$=0.39). In this study, the length of the long bones and the presence of nutrient foramen in mid diaphyseal region doesn't differentiate between the two groups, which correlates with the studies by Chatrapathi and Shamsunder.5,6 For all long bones except the femur, a sharp border delineating the cortex and medulla in X-rays was present ($p<0.05$). For the fibula, humerus, radius, and ulna, parameters such as circumference at mid diaphyseal region, cortical thickness, antero-posterior diameter, presence of diaphyseal trabeculae, and cortical thickness to total diameter ratio were found to be insignificant.

In conclusion, this study attempts to shed light upon a gray and often neglected area — anthropology. This presentation will greatly impact criminologists and anthropologists, as it is a common scenario encountered in routine practice. This presentation will also help establish a baseline determinant for human bone differentiation, which will aid further studies and yield a fruitful medicolegal outcome. With the advent of modern scientific tests, human anthropometry has become a mere platitude of sorts; this study attempts to reach back to the grassroots of anthropometry and usher in a new scientifically backed method of human bone identification and differentiation.





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**Anthropometry, Skeletal Remains, Animal Bones**





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