H78 Skeletal Markers of Obesity in the Lower Leg

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After attending this presentation, attendees will understand the biomechanical effects of obesity on the bones of the lower leg and the subsequent skeletal markers, which can suggest obesity during life.

This presentation will impact the forensic community and/or humanity by providing researchers further insight into the relationship between soft tissues and skeletal tissues during life. The University of Tennessee has the unique opportunity to provide this type of research due to the large donated collection with extensive antemortem records.

Obesity in the United States is reaching epidemic proportions. More than fifty percent of all adults are overweight, with a fast growing percentage of obese children. Skeletal markers of obesity are investigated as a combination of multiple traits due to the complex nature of obesity on the human skeleton. The purpose of this study is to examine the biomechanics of obesity in the vertebral column, hip and knee and its relationship with osteoarthritis, diffuse idiopathic skeletal hyperostosis (D.I.S.H.), and the frequency of fracture. This project investigates osteoarthritis of the medial and lateral tibial plateau and proximal femur, fracture of the distal fibula and proximal femur, as well as the presence of D.I.S.H. A total of 44 skeletons from obese (n=21) and non-obese (n=23) adult individuals were analyzed, with ages ranging from 20 to 86 years. The skeletons represented in this sample are from individuals of known age, height and weight, from the donated collection of the Forensic Anthropology Research Facility at the University of Tennessee, Knoxville.

In a review of clinical literature on the biomechanics of obesity, the effects of obesity in the leg can be separated into two separate suites of traits for the two dominant types of knee malalignment associated with obesity. *Genu varum* is responsible for greater torque on the hip and knee, decreased joint space on the medial knee joint, 100% of weight bearing on the medial side and osteoarthritis of the medial tibial plateau. There are relatively few effects of this *varus* malalignment on the foot. In contrast, *genu valgum* preserves the integrity of the knee and hip, compromising the integrity of the foot and ankle, which will be investigated in a future research project. From clinical reports, the ankle is more prone to severe lateral malleolar fracture and greater rear foot movement as a result of this condition. Obese individuals will exhibit greater asymmetry, with individuals typically favoring the right side. The findings of this skeletal analysis support some of these clinical findings. Osteoarthritis of the left lateral tibia, the right medial tibia and the right proximal femur all show fairly significant Chi-square relationships to obesity at the level $p = 0.1$, with these results being asymmetric and not completely consistent with the clinical findings. The presence of D.I.S.H. was significantly correlated with obesity at the level $p = 0.1$. There was no significant correlation between obesity and ankle fracture or between obesity and hip fracture in this skeletal sample.

As the number of obese individuals living today increases, so will the number and frequency of obese in skeletal populations. Thus it is of significant forensic concern to be able to determine whether a skeletonized individual was obese or not and whether this can be ascertained from the skeleton. This preliminary research, despite the small sample size, shows promise for the future for determining obesity in the skeleton. Skeletal markers of obesity investigated as a suite of traits could prove useful to identification in the field of forensic anthropology. Furthermore, the biomechanics of obesity need to be better understood in order to stop the cycle of obesity.

Obesity, Skeletal, Biomechanics

 ** Presenting Author*