Abstract 105: American Journal of Physical Anthropology; Vol. 153. 2014.

Use of Osteon Circularity to Determine Species Affiliations can be Confounded by Habitual Load Complexity

KENDRA E. KEENAN, SCOTT M. LITTON, GREGORY A. SKEDROS, JOHN G. SKEDROS[1],
1 Dept. of Orthopaedics, Univ. of Utah School of Medicine, Salt Lake City, Utah

Osteon circularity (On.Cr) is useful for studying load history in limb bones, especially to distinguish high complexity loading (e.g. torsion+bending) from simple complexity loading (e.g. unidirectional bending). On.Cr is also useful for determining species affiliations. We hypothesized that load complexity influences On.Cr in ways that can confound species determinations. Using ImageJ we examined bones representing a spectrum of load complexities: low, intermediate-A, intermediate-B, and high. Specimens included skeletally mature: (1)sheep, deer and equine calcanei (simple), (2)sheep and equine radii (intermediate-A), (3)human,chimpanzee femora at proximal shaft, and equine third metacarpals (intermediate-B), and (4)sheep tibiae (high); n=7/each non-primate; n=8/chimpanzee; n=12/human(25-71yrs;avg53years;22-71;male:female=3:9). Results showed that even in the "simple" category, differences in On.Cr based on regionally habitual (prevalent/predominant) strain-mode (tension, compression, neutral axis) are inconsistent: only 3 of 9 bones that can be considered in this context showed significant differences for habitual tension vs. compression regions. Additionally, On.Cr based on load-complexity category was inconsistent, as shown in both sheep and horse bones: statistically significant differences were found between load-complexity categories of the sheep bones but not the equine bones. Consequently, a fragment of a sheep tibia could inadvertently be identified as being a horse bone. These data raise concern in studies that use On.Cr to distinguish species without also considering the influence of load history. Specifically, the possible confounding influence of load history should be considered when comparing these bone 'types': ribs (load complexity likely simple), humerus and tibia (likely intermediate), and femur (likely intermediate in proximal shaft vs. high complexity in mid-shaft).