Pecha Kucha Presentation Session 6, Friday 3:35-3:55 pm

New reconstruction of the pelvis of KNM-WT 15000 supports a wide body shape for Early African *H. erectus*

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The origin of the slender body shape of *H. sapiens* has intrigued paleoanthropologists for a long time, and several scenarios have been proposed to elucidate when and how this morphology emerged in the human lineage (1). The cylindrical thermoregulatory model supports that this body shape emerged ~2 million years ago (deep evolutionary origin) in early African *H. erectus* (namely *H. ergaster*) as an adaptation to the climate of the regions inhabited by this species. An alternative model suggests that this body shape emerged in *H. sapiens* (recent evolutionary origin), with *H. neanderthalensis* and early African *H. erectus* sharing a wide body shape consistent with high metabolic rates. A third scenario might be compatible with the two-body morphologies previously proposed as support for the existence of a great post-cranial morphological diversity in *H. erectus* (2). The well-preserved skeleton of KNM-WT 15000, a juvenile male early African *H. erectus* dated to the Lower Pleistocene (1.6 Ma), is a key fossil for understanding the origin and evolution of body shape in *Homo*. However, despite its relevance, no quantitative reconstruction of the torso of this specimen has been carried out to date. This is the aim of the current investigation. Due to the young age at death of KNM-WT 15000, 3D torso models of an ontogenetic *H. sapiens* male sample composed of 22 juveniles (7-12 y.o), 15 adolescents (13-19 y.o) and 15 adults (20-44 y.o), and 10 adult *P. troglodytes* were segmented from CT scans. One thousand and thirty (1030) landmarks and semilandmarks were measured on the resulting models to collect overall thoracic and pelvic anatomical relationships within the torso. Patterns of thoraco-pelvic morphological covariation were computed using two-block partial least squares analyses and combining the ontogenetic groups with each other and with the chimpanzee sample to assess patterns of covariation shared by these two taxa and probably maintained since the last common ancestor *Pan-Homo* (3). The statistically significant models were used to predict the pelvic morphology of KNM-WT 15000 from its previously reconstructed thoracic morphology (4). Additionally, a *H. sapiens* ontogenetic shape vector was applied to simulate the hypothetical adult pelvic morphologies. The resulting pelves were compared with previous reconstructions of *Australopithecus* and *Homo* pelves by means of principal component analysis and clustering methods based on Procrustes distances between specimens. Three models showed statistically significant (s.s) covariation: 1) adult *H. sapiens* (70% s.s covariation), 2) juveniles-adolescents-adults *H. sapiens* (90% of s.s. covariation), and 3) the latter pooled with *P. troglodytes* (90% of s.s covariation). The first two models yielded *H. sapiens*-like pelvic morphologies characterized by mediolaterally narrow pelves with vertically oriented iliac blades and short and narrow ischiopubic regions. The third model produced a pelvis with marked iliac flaring and orientation that shows affinity with the pelves of *H. neanderthalensis* and *H. heidelbergensis*, although the short and narrow ischiopubic region is indistinguishable from that of *H. sapiens*. The marked iliac flaring of the pelvis resulting from the third s.s. model is consistent with previous reconstructions (5) and shows the morphology that might most resemble KNM-WT 15000; evolutionarily, because it comes from a statistical model that overarches thoraco-pelvic covariation probably maintained in the human lineage and anatomically, because the iliac morphology and orientation are compatible with the long femoral neck of KNM-WT 15000 and its mediolaterally wide thoracic morphology, which was aligned with the pelvis. The resulting torso supports a wide (and deep) body shape for KNM-WT 15000 consistent with high body weight and metabolic rate in early African *H. erectus*. This reconstruction lays the ground for functional interpretations that must be evaluated with appropriate methods in future studies.

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