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The cuboids from Sima de los Huesos (Atapuerca, Burgos, Spain)

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The preservation of *Homo* fossil foot remains prior to modern humans and Neandertals is very scarce throughout the fossil record. Several cuboid bones have been recovered belonging to genus *Homo* previous to Neandertals and modern humans (e.g. Jinniushan, OH8, Omo-Kibish 1, LB1 and those from *Homo naledi*). However, it is unknown exactly when the modern morphology of the cuboid has arisen and its morphological relationship with Neandertals.

In the Middle Pleistocene site of Sima de los Huesos (SH) more than 6,800 human fossil fragments, belonging to at least 28 individuals, have been recovered up to date. Using a variety of techniques, the hominin-bearing layer could be assigned to a period around 430 thousand years ago [1]. Morphologically, these fossils are believed to represent an ancestral European population that evolved into the Neandertals [1]. From this sample of human fossils, 22 correspond to cuboid bones, which represent more than the 40% of the *Homo* fossil record prior to *Homo sapiens* (more than 68% if we exclude the Neandertals). These 22 fragments correspond to a minimum of 18 elements from to at least 10 individuals (seven adult and three immatures). From the adult individuals identified in the sample, three of them are probably males and one likely belonged to a female individual [2]. Due to the evolutionary and morphological relationship between Neandertals and the Sima de los Huesos hominins [1, 3], important information can be extracted from the SH cuboids that is relevant to understanding the evolution of the Neandertal and modern foot.

The analysis of 15 metrical variables in the collection of the cuboid bones from the Sima de los Huesos site allows us establishing similarities or differences with other samples/populations. The cuboid of the Sima de los Huesos hominins, as that of Neandertals, is robust and antero-posteriorly short. Furthermore, the SH cuboids display long facets for lateral cuneiform and calcaneus. These last traits probably are related to the general robusticity of these hominins from the Middle Pleistocene [3]. Trinkaus [4] established a modern morphology of the Neandertal foot indistinguishable of modern humans in the implied locomotor capabilities. Nevertheless, this author established a pronounced wedging and a general robusticity for this bone in Neandertals relative to modern humans. In the cuboid bones from Sima de los Huesos this character is also observed through the wedging index, which is significantly lower than that in modern humans. The presence of a wedged cuboid in the Asian specimen of Jinniushan [5] suggests that this trait could be primitive in the last phases of genus *Homo*.

The conclusions of this study of the human cuboids from SH confirms the evolutionary relationship between this Middle Pleistocene population and the Neandertals as sister groups. Nevertheless, some traits in the foot, as well as those from the cranium and the other postcranial elements, allow us to differentiate the SH hominins and Neandertals. These results are also in accordance with the proposed large corporal size for the population from Sima de los Huesos and the primitive biotype of this hominins from the Middle Pleistocene [3].

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