Mesolithic and Chalcolithic mandibular morphology: using Geometric Morphometrics to reconstruct incomplete specimens and analyse morphology

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Abstract

Human skeletal remains provide direct palaeobiological data about past populations. However, post depositional factors often cause bone fragmentation and so reduce the sample size of morphological studies. Geometric Morphometrics (GM) may be used to analyse morphology, but also to estimate the original form of incomplete mandibles that would otherwise be excluded from analysis. In this study we use a GM based reconstruction method to estimate the original morphology of incomplete Mesolithic and Chalcolithic mandibles from the present Portuguese territory. Moreover, we compare mandibular morphology between those samples to examine hypothetical morphological differences between those populations and how those differences may relate to other underlying variables.

To reconstruct the incomplete specimens, complete mandibles from each period were used as reference to estimate the location of the missing landmarks of the target incomplete specimens from the same chronology. The Thin Plate Spline (TPS) method of the Geomorph R package was used to that end. GM was then used to compare the morphology of the full sample of 34 Mesolithic (n=22) and Chalcolithic (n=12) mandibles. Dental wear was also recorded to test if hypothetical morphological differences between the two groups relate to disparities in masticatory function.

Morphological analysis of the full sample of mandibles shows little overlap between specimens of the two chronologies. Because mandibular morphology relates to biological affinities and to masticatory mechanics, such differences may relate to any of the two factors. However, consistently with previous studies, the Mesolithic sample shows heavier dental wear on average than the Chalcolithic sample. This may suggest differences in diet and masticatory mechanics relate to the morphological differences, but future studies will explore this hypothesis.

Keywords: Mesolithic, Chalcolithic, Portugal, Biological anthropology, Form, function

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