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ECR 2025 / C-23931

Bone Indicators of the Jaw Measured by Computed Tomography for Estimating Age at Death

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Authors:

J. Pinheiro, R. Coutinho

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Purpose

Age at death (AAD) estimation is a central focus of anthropological and archaeological analysis of human skeletal remains. Several confounding factors and specificities act on the environment in which they were deposited. This study tests the possibility of estimating AAD from archaeological specimens using a contemporary population sample with known biometric data as a reference, using computed tomography equipment to measure bone indicators. Accurate estimation of AAD in the human skeleton is an important requirement for establishing a biological profile and individual identification and remains a major...

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Methods and materials

Main objective: to correlate bone indicators, namely density measured in Hounsfield Units, area, thickness of the cortical bone of the mandibular condyles and the biological age of adult individuals with known biometric data; Among the bone indicators, the following stand out [Fig 1] [Fig 2]: Density and Area of Condyles in various anatomical planes (axial, sagittal and coronal); Cortical and Trabecular Bone Density; Cortical Bone Thickness in the axial and sagittal plane; The sample is composed of two distinct groups. The first group is made up of...

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Results

Table [Table 1] presents the descriptive statistics for the density and area variables in the three orthogonal planes for the mandibular condyles. It can be seen that the density for both condyles is between 133 and 705 and has an average of 501 Hounsfield Units [Fig 3]. The following scatter plots [Fig 4] demonstrate the values of axial, sagittal and coronal mean density for samples 78, 63 and 67 together with the group of known variables. For samples 78, 63 and 67, the chronological ages of "zero"...

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Conclusion

The cortical bone presents the bone density values closest to the reference sample and could be a possibility for future research in other locations of the skeleton. Although there is a correlation between bone density and age for specific regions of the mandibular condyles, it was not possible to reliably predict the MI of the archaeological samples.

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Personal information and conflict of interest

J. Pinheiro: Nothing to disclose R. Coutinho: Nothing to disclose

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References

Age at death estimation of adult males using coxal bone and CT scan: A preliminary study, Forensic Science International, Volume 186, Issues 1–3, 2009, Pages 14-21, ISSN 0379-0738, <https://doi.org/10.1016/j.forsciint.2008.12.024>. Boldsen JL, Milner GR, Konigsberg LW, Wood JW. Transition analysis: a new method for estimating age from skeletons. In: Hoppa RD, Vaupel JW, eds. Paleodemography: Age Distributions from Skeletal Samples. Cambridge Studies in Biological and Evolutionary Anthropology. Cambridge University Press; 2002:73-106. Brennaman, A. L., Love, K. R., Bethard, J. D., & Pokines, J. T. (2017). A Bayesian Approach to...

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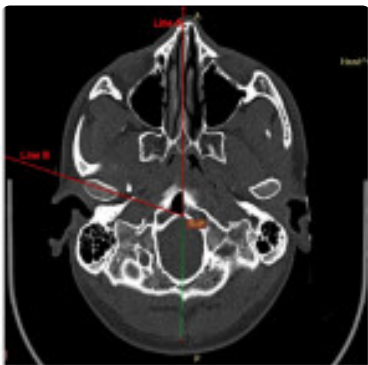


Fig 1: Measurements locations and alignment.

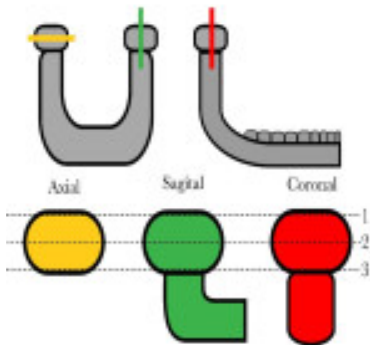


Fig 2: Measurements locations and alignment.

Analysis of the Area and Density of the Mandibular Condyles (n=83)						
	Density Adult	Area Adult	Density Sagittal	Area Sagittal	Density Coronal	Coronal Area
Right Mandibular Condyle						
Average	276	1.52	143	0.91	114	2.42
Standard deviation	170	0.47	140	0.24	140	0.05
Minimum	137	1.19	91	0.38	42	1.26
Maximum	922	3.29	384	1.42	304	10.4
Left Mandibular Condyle						
Average	428	1.90	189	1.04	138	2.31
Standard deviation	126	0.45	134	0.22	101	0.99
Minimum	128	1.04	106	0.34	250	0.68
Maximum	627	2.76	314	2.09	331	4.07
Bilateral Analysis (Left and Right)						
Average	301	1.71	167	0.96	126	2.36
Standard deviation	139	0.40	139	0.23	147	0.74
Minimum	133	1.05	213	0.29	117	1.18
Maximum	709	2.88	796	1.63	523	10.4

Table 1: Analysis of the Area and Density of the Mandibular Condyles (n=83).

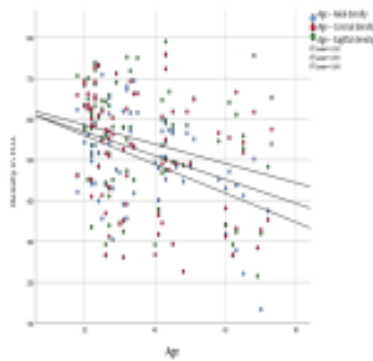


Fig 3: Sample distribution by density and chronological age ($p < 0.05$).

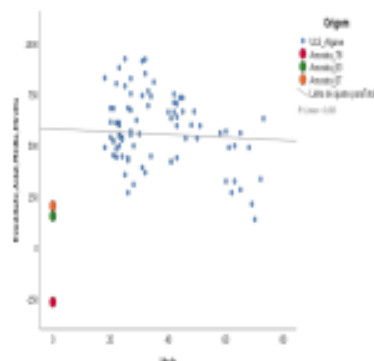


Fig 4: Dispersion of the right mean axial density of the samples ($p < 0.05$).

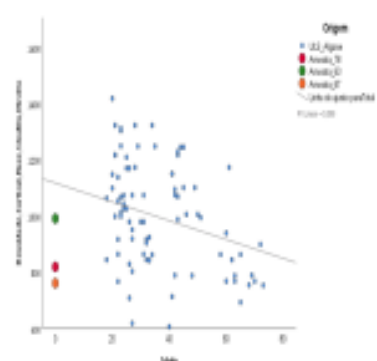


Fig 5: Dispersion of samples by cortical density of the base of the right condyle by...

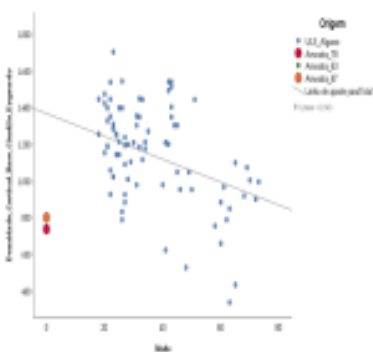


Fig 6: Dispersion of samples by cortical density of the base of the left condyle by...