A10   Sex Estimation of a Croatian Population Based on Computed Tomography (CT) Scans of the Crania

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Learning Overview: The goal of this presentation is to explain the possibilities of sex estimation (in the Croatian population) based on morphological and metric analysis of orbital dimensions from CT scans.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by rethinking how morphological and metric traits in sex estimation can perform differently in different skeletal elements.

Aims: To determine the reliability of sex estimation on the CT scans on the Croatian population in the orbital area.

Methods: This study was approved by the Hospital's Ethics Committee and the Ethics Committee of the University Department of Forensic Sciences. A total of 200 CT scans (equal number of males and females, aged 18 years and older) were collected; CT's were anonymized, and only sex and age were disclosed. Only those scans that had intact orbital margins were included in this study, as well as those that had no pathological and traumatic changes that could affect the measurements. Data analysis was performed using the OsiriX® Program OsiriX® v.3.9.4 using, in the 3D viewer tab, the 3D Volume Rendering mode of visualization and measured using a measurement tool. The obtained data were recorded in an Excel® sheet. Six orbital measurements were taken (orbital breadth—bilateral, orbital height—bilateral, biorbital breadth, interorbital breadth, bimaxillary breadth, and zygoorbitale breadth).[1] Morphological analysis was based on the orbital shape and scored as 2: hyperfeminine; -1: feminine; 0: neutral/undeterminate; +1: masculine; +2: hypermasculine.[2] Statistical analysis was performed in Statistical Package for the Social Sciences (SPSS) with the statistical significance set at P=0.05. The normality of distribution was tested with the Shapiro-Wilk test. The accuracy of the discriminant functions was evaluated in the original and cross-validated samples.

Results: Measurements interorbital breadth, bimaxillary breadth, zygoorbitale breadth, and the left-sided orbital breadth were excluded because of the inter-observer error. For the inter-observer error in morphology, Weighted Kappa was 0.41520 (moderate agreement). There were no statistically significant differences between the right and the left side of orbital width and height. Males and females exhibited statistically significant sexual dimorphism except for the interorbital breadth (P=0.114). The accuracy of the orbital measurements varies, with the lowest in zygoorbital breadth (55%) and the highest for the biorbital breadth (72.5%) and left orbital breadth (73.5%). The discriminant functions of classification rated from 69% to 70.5%. Morphological traits exhibited statistically significant sexual dimorphism (P<0.001) and a high classification rate (94.5%).

Conclusion: The most valuable orbital measurements for sex estimation in the Croatian population are the orbital width and height as well as the biorbital breadth. On the other hand, the interorbital breadth did not exhibit sexual dimorphism in the Croatian contemporary population. The highest value of the classification rate/accuracy for the orbital measurements was 70.5%, which is not appropriate for forensic sex estimation. The morphological traits exhibited high sexual dimorphism and high classification rate. Thus, in this example, the morphological traits are the more valuable sex indicator, rather than the metric traits.

Reference(s):

[1.] Langley N.R., Jantz L.M., Ousley S.D., Jantz R.L., Milner G. Data collection procedures for forensic skeletal material 2.0. *University of Tennessee and Lincoln Memorial University;* 2016, Knoxville, TN.
[2.] Acsádi G., Nemeskéri J., Balás K. History of human life span and mortality. *Akadémiai Kiadó Budapest*; 1970, Budapest, EU.

Sex Estimation, Computed Tomography, Orbital Area

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