A55 Comparative Performances of Sacral Osteometrical and Geometric Morphometrical Studies Based on Multi-Slice Computed Tomography Explorations to Assess Sexual Dimorphism

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After attending this presentation, attendees will become familiar with different statistical methods that can be used to estimate sacral sexual dimorphism from multi-slice computed tomography data. This presentation will present classic and original multivariate analyses based on metric data and a geometric morphometric analysis.

This presentation will impact the forensic science community by showing classification and segmentation trees as an alternative statistical tool to classic multivariate analysis for sex determination in anthropological research, with results similar to geometric morphometric analyses.

Sex estimation from skeletal remains for identification is an important component of many anthropological investigations. Sacrum, due to its contribution to the pelvic girdle, demonstrates sex differences. This sacral sexual dimorphism is classically studied by using multivariate analysis on metric data. Geometric morphometric analysis is another pertinent approach widespread in anthropological research to study sexual dimorphism.

The present study seeks to compare two statistical methods using classic published metric parameters and geometric morphometric analysis for sacral sex estimation based on multi-slice computed tomography.

A total of 13 landmarks were located on sacral multi-slice computed tomographies of 174 individuals (86 males and 88 females). Fourteen variables (seven distances and seven indices) were selected from the literature for their effectiveness in sex determination.

First, a univariate analysis using t-tests was performed on all. Then multivariate statistics, including Linear Discriminant Analysis (LDA) and classification trees, were realized from variables that showed a significant sexual difference in the univariate analysis. A geometric morphometric analysis was realized from the 13 landmarks and a Canonical Variate Analysis (CVA) was performed from procrustes landmarks coordinates.

The accuracy rate for sex assessment using LDA was 81.3% from five distances and 79.4% from five indices. Sex predict yielded 85% with classification and segmentation tree using four metric parameters (three distances and one indice). The CVA results based on the 13 procrustes landmarks coordinates showed a correct classification for 87.9% of the individuals.

These results were in accordance with previous studies about sacral sex assessment. Classification and segmentation trees showed better results than linear discriminant analysis and similar results to geometric morphometric analysis, but used only four parameters. Classification and segmentation tree seems to be a pertinent and easily alternative statistical tool to classical multivariate analysis for sex determination in anthropological research.

This study revealed that geometric morphometric analysis did not demonstrate a more objective superiority in sacral sexual determination than anthropometric analyses. Moreover, this study provided a particular application of virtual anthropology by transposing classical metric parameters studied on dry bones to multi-slice computed tomography.

Sexual Dimorphism, Classification Trees, Geometric Morphometrics

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