**H83**      **Geometric Morphometric Analyzes From Dental Orthopantogram Images: A Regional Anatomical Analysis of Sexual Dimorphism in the Adult Mandible**

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After attending this presentation, attendees will have a better understanding of a new method of sex assessment through the analysis of clinical panoramic X-ray images.

This presentation will impact the forensic science community by introducing a novel method of sex determination following a
skull assessment.

The human mandible has routinely been utilized in forensic assessment of age at death, sex determination and biological affinity.  However, such studies have generally utilized conventional assessments of size and shape variables, and as such fail to record the true nature of shape differences due to dimorphism in this functional skeletal element.  The research here presented utilizes geometric morphometric techniques to investigate and quantify shape and size variation in the morphology of the mandibular corpus and ascending ramus, and consequently the potential for forensic human identification.  The results of a novel morphometric study using clinical panoramic scanning x-radiography to study the extent of morphological variation within a modern Italian sample population are presented.

Clinical digital orthopantogram images (OPG) were acquired of the upper and lower jaws of 50 male and 50 female participants.  Ten type I and type II 2D landmarks were applied to the symphysis, and condylar and coronoid processes.  One hundred equidistant semi-landmarks were established along the inferior border of the corpus, and the posterior border of the ascending ramus.  The resulting landmark configurations ($n$ 100) were subjected to Generaliszd Procrustes Analysis (GPA) with Full Tangent Space Projection.  Principal Components Analysis (PCA) was applied in order to assess population variation.  Factor loadings were subject to Canonical Variates Analysis with stepwise and leave-one-out classification in order to assess the effects of sexual dimorphism on mandibular shape.  The results showed individuals to be correctly classified for sex in 89.6% of cases, (males were correctly classified in 90.1% of cases, and females in 85.6%).

Analyzes of the mandible were subsequently broken down into anatomical regions based on the mandibular body, the bony processes and the ascending ramus in order to investigate regional functional differences in the expression of dimorphism in mandible.  A partial least squares (2-block PLS) method was further applied, in order to examine patterns of covariation between shape variables and the exploration of patterns of functional modularity.  Most interestingly the results indicate the greatest level of individual and sex-specific variation is found in the shape-curve and pattern of the inferior corpus, in contrast to that of ramal flexure.  Stepwise permutation tests and analyzes of regional covariation indicate functional coupling, with a moderate degree of modular integration between the corporal and ramal regions suggesting that functional ties between the units are correlated in influencing sex-based morphological trait expression between anatomical regions, indicating that the geometric relationship between the mandibular corpus and the ascending ramus offers significant power for forensic identification purposes.  Consequently such units may be studied together or in isolation, and this may allow for the development of identification criteria based on modular unit shape variables which may be applicable for both whole specimens and fragmented remains depending on the forensic situation.  Overall the results are strongly significant and suggest that both dependently and independently that the shape relationship between the mandibular corpus and the ascending ramus offers significant power for forensic identification purposes.  Of particular interest is that inferior corpus border shape offers significant discriminating potential in the assessment of sex, with the effects of allometry being strongly implicated.  These and other implications of the shape analysis will be discussed.
**Sex Assessment, Geometric Morphometrics, Forensic Anthropology**