



### A21 The Potential Use of Five Cranial Traits for Sex Assessment in Forensic Cases

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After attending this presentation, attendees will better understand five sexual dimorphic non-metric cranial traits and their potential in forensic cases.

This presentation will impact the forensic science community by illustrating the usefulness of the foramen magnum shape, the Zygomatic Arch Ending (ZAE) with respect to the external auditory canal, the sigmoid notch, the mandibular ramus flexure, and the Gonial Angle (GO) area muscle attachment for sex determination.

Sex assessment is an essential step in human identification, in both legal cases and archeological context. The highest accuracy for sex determination is achieved when the complete skeleton is available, although there are situations such as cremated, dismembered, and otherwise taphonomically altered skeletal remains in which the use of a complete skeleton is not possible. The goal of this study is to evaluate the usefulness of five non-metric cranial traits that are considered resilient in sex assessment and their potential application in forensic cases.

Previous described non-metric cranial traits (foramen magnum shape, ZAE in respect to external auditory canal, sigmoid notch, mandibular ramus flexure and GO area muscle attachment) were analyzed in 100 skulls, 45 females and 55 males, from 34 to 92 years of age. All individuals were White adults from the W.M. Bass Donated Skeletal Collection at the University of Tennessee. Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version 15. Comparisons between groups were conducted using X2. Discriminant function analysis model was performed to develop specific formulas for sex determination.

Foramen magnum, sigmoid notch, and mandibular ramus exhibited no significant differences between males and females. In contrast, ZAE and GO morphology revealed strong significant differences between these two groups. Based on these two parameters, the function obtained by discriminant analysis,  $\text{Sex} = -1.992 + (\text{ZAE} * 2.123) + (\text{GO} * 0.631)$  with a zero result pointing to males and one result pointing to females, correctly classified 79.8% of the original cases. In fact, taking into account all five cranial traits on the discriminant function analysis, this demonstrated the usefulness of ZAE and GO for sex determination, arriving at the same formula and correctly classifying 79.8% individuals according to their sex.

This study evaluated the usefulness of five different cranial traits and their potential value in forensic cases and indicated that ZAE and GO were the best indicators for sex assessment. These two anatomical regions correspond to two highly resistant skeletal structures, allowing forensic anthropologists to use them for this purpose alone or in combination with other methodologies, when the preservation and taphonomic factors affected skeletal material, although traits that are sexually dimorphic in one population may be much less so in another. Therefore, further studies in other populations are necessary to extend the diagnostic value of these sexually dimorphic traits.

#### **Cranial Traits, Sex Assessment, Non-Metric Traits**