H111 An Examination of the Relationship Between Asymmetrical Antemortem Tooth Loss and Asymmetrical Cranial Suture Closure

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After attending this presentation, attendees will be acquainted with the results of an examination of the possible relationship between asymmetrical antemortem tooth loss and asymmetrical cranial suture closure. In addition, attendees will understand the potential impact of asymmetrical cranial suture closure on the estimation of age-at-death.

This presentation will impact the forensic science community by providing a foundation for further examination of the causes of asymmetrical cranial suture closure, thus facilitating the refinement of suture-based age-at-death estimation methods.

When human remains of forensic significance are recovered in a fragmentary condition, cranial suture-based age estimation methods can be extremely useful in establishing or confirming an age estimate. If only one half of the skull is recovered, however, bilateral asymmetry in suture closure could lead to an erroneous age estimate and hinder identification of the individual.

The objective of this research was to determine whether there was a relationship between asymmetrical antemortem tooth loss and asymmetrical cranial suture closure in a modern human sample. One hundred-one crania from the historic Hamann-Todd Collection and the modern Bass Collection were examined in this study. Degree of suture asymmetry was measured at thirteen suture sites in each individual. The Variable Points of Dental Asymmetry (PDA) was designed and implemented to measure asymmetry in posterior tooth loss. It was hypothesized there would be a positive correlation between points of dental asymmetry and degree of suture asymmetry. The variables age-at-death, sex, ancestry, and skeletal collection of origin were also evaluated for influence on degree of suture asymmetry. A mixed model analysis of variance was conducted using IBM® SPSS Statistics Version 21.[1] All effects were evaluated for significance at the $p<0.05$ level.

The main effect of PDA on degree of suture asymmetry was not significant ($p=0.393$). The main effect of age-at-death on degree of suture asymmetry was also not significant ($p=0.969$). However, the interaction effect between suture site and age-at-death was significant ($p=0.003$). The main effect of sex on suture asymmetry was not significant ($p=0.277$). The mean degree of suture asymmetry in those of African ancestry was higher than in those of European ancestry ($p=0.05$). The difference in suture asymmetry between the Bass and Hamann-Todd subsamples approached significance ($p=0.064$).

This study did not confirm a relationship between dental asymmetry and suture asymmetry based on the insignificant main effect of PDA on suture asymmetry. However, further research into the possible relationship between asymmetrical antemortem tooth loss and asymmetrical cranial suture closure is warranted. The variable PDA may not be truly representative of asymmetry in antemortem tooth loss. A variable that better captures the complexity of the biomechanics of mastication may demonstrate a relationship with suture asymmetry. A new variable representing asymmetry in antemortem tooth loss will be designed and incorporated into the next stage of research.

Although the main effect of age on suture asymmetry was not significant, the significant interaction effect between suture site and age indicates that there was a relationship between suture asymmetry and age at some sites or in some age categories, but not others. This interpretation is supported by the literature, which suggests that some suture sites are much more likely to achieve advanced closure with age than others, and therefore have more opportunity to achieve bilateral asymmetry.[2,3]

The insignificant effect of sex on suture asymmetry indicates an absence of sexual dimorphism in this study. The borderline significant difference in mean degree of suture asymmetry between individuals of European and those of African ancestry indicates that suture asymmetry varies between ancestral groups. The main effect of skeletal collection of origin approached significance, but this may be a result of bias introduced by the differing distribution of the subsamples according to age-at-death, sex, and ancestry. Alternatively, it could be evidence of secular change in degree of suture asymmetry.

References:

1. IBM® Corporation. IBM® SPSS Statistics Version 21. 2012.
2. Meindl RS, Lovejoy CO. Ectocranial suture closure: A revised method for the determination of skeletal age-at-death based on the lateral-anterior sutures. Am J Phys Anthropol 1985;68:57-66.
3. Falk D, Konigsberg L, Helmkamp RC, Cheverud J, Vannier M, Hildebolt C. Endocranial suture closure in rhesus macaques (Macaca mulatta). Am J Phys Anthropol 1989;80:417-28.

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