H64 Investigation of the Potential for Use of 3D Topographical Data and Geographical Information Systems for Age-at-Death Determination From Pelvic Skeletal Remains

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After attending this presentation, attendees will have been introduced to the use of Geographical Information Systems (GIS) and the approach of considering skeletal remains as "geographical landscapes" to explore methods of age-at-death determination. Attendees will have seen that the results suggest promising potential for further study and will understand some of the issues faced by the approach, such as standardization of orientation and mitigation against variations in size.

This presentation will impact the forensic science community by: (1) serving as a springboard for further research; (2) contributing to the understanding of age degeneration of pubic symphyseal and auricular surface (pelvic) features; and, (3) encouraging future development of age-at-death determination methods.

The use of the pubic symphyseal and the auricular surfaces in methods of determining age-at-death from skeletal remains are well established, standard, and are commonly used. Current methods involve recording the phase that best corresponds to the specimen being analyzed, using a set of reference standard phase images and descriptions and visual observation of several features. While they have been shown to have a good level of accuracy, such methods inevitably involve an element of subjectivity and results are somewhat dependent on observer expertise. This study explores the potential of a quantitative method of determining age-at-death using parameters obtained from analysis of topographical data within a Geographical Information System (GIS). Pubic symphyseal and auricular surfaces from skeletal remains from a known sex and age-at-death collection (St. Bride's Church Crypt Assemblage, London, UK) were scanned to produce x, y, z point cloud data. The study sample included scan data from the os coxae of 89 individuals (49 left-side and 40 right-side), an age range of 17 to 91 years of age-at-death and the male to female ratio was 1.5:1 (54 males, 35 females). The 3D data from the regions of the pubic symphyseal and auricular surfaces were explored as "geographical landscapes" within arcGIS (ESRI® software). For the pubic symphysis surface, the relationship between age-at-death and the parameters (mean slope and mean aspect) were investigated. In general, values of mean slope and mean aspect, across the pubic symphysis surface, decreased with increasing age-at-death. These correlations were shown to be significant for the male study sample ($p<0.05$). However, a similar correlation for females was not observed, possibly due to the smaller sample size and confounding contributions to pubic symphyseal surface features inherent to the female biological function of the pelvis. For the auricular surface, the relationship between age-at-death and the parameters (mean elevation, mean point density, and mean slope) were investigated. In general, values of mean elevation decreased with increasing age-at-death while, values of mean point density and mean slope increased with age-at-death. The correlation between mean point density and age-at-death was shown to be statistically significant ($p<0.05$) for the whole study sample (sexes combined). The work presented represents a preliminary study but clearly indicates that there is the potential for the development of such work to generate a reliable, quantitative method for determining age-at-death from skeletal pelvic remains using GIS. Further work is recommended and this should include increasing the sample size and, in particular, the number of female specimens.

Age-at-Death, Pelvis, GIS

 ** Presenting Author*