



## Physical Anthropology Section - 2013

### H75 Suchey-Brooks Method Applied to 3D Symphysis: A Comparative Study on a Sample of 193 Real Pubic Bones and Their Virtual Copies

*Deshpriya N. Dhuny, MD\*, 35 Rue Sainte Catherine, Nancy, 54000, FRANCE*

After attending this presentation, attendees will learn how the Suchey-Brooks method of Age-At-Death (AAD) estimation can be applied to virtual bones and if virtual anthropology is reliable enough to replace traditional methods.

This presentation will impact the forensic science community by showing how classical anthropological AAD techniques can be used for analysis of virtual pubic symphysis, what are its scopes for the future, and how it can be improved to produce optimal results.

Virtual anthropology has been greatly developed by numerous teams in the past few years. Excellent agreement has been shown between the results of bone sample analysis and those of Three-Dimensional (3D) image analysis. The goal of this study was to show whether 3D reconstructions of pubic symphyses could render accurate AAD estimations by applying the Suchey-Brooks technique, in comparison to the original dry bones. A secondary objective was to test the inter-observer error between the results obtained by an experienced observer and a novice.

The study was carried out on a series of 193 dry pubic symphysis of known age and sex at death, obtained from the anthropological collection of Montpellier (Pr Baccino). Two observers, an experienced and a novice physician in forensic medicine, performed AAD estimation using the Suchey-Brooks method. The real ages of the bone samples were not known to either of the two observers prior to the test. Each observer first analyzed the series of real bones and their virtual copies afterward. The dry bones were each scanned separately on a large detector CT using high-resolution and standard mode. Helical acquisitions were obtained with 64 rows and the slice thickness was 0.5mm for acquisition and 1mm for reconstruction. Volume Rendering Technique (VRT) reconstructions were performed for each sample in order to obtain 3D images for every bone. For each observer, comparative tests were done between the AAD estimates of dry bones and the AAD estimates of 3D bones. Consecutively, inter-observer comparisons were performed. The Kappa reproducibility test was used for calculation of intra-observer and inter-observer agreement.

This study was performed on a population of 193 dry pubic symphysis (52 female and 141 male) from which 185 virtual bones (50 female and 135 male) were produced after CT. The loss of eight virtual bones was due to human error.

The study shows poor inter-observer reproducibility for the dry bones ( $Kappa=0.26$ ) as well as for the scanned bones ( $Kappa=0.35$ ). The intra-observer (dry bones versus scanned bones) Kappa coefficients are of 0.28 for the novice (poor reproducibility) and 0.44 for the experienced observer (moderate reproducibility). This suggests that the Suchey-Brooks method is better applied by a more experienced observer. The mean difference between real age and estimated age for each of the 193 dry bones varies between -0.4 years and +3.4 years, whereas for virtual bones, the mean difference on the 185 subjects was between +1.66 years and +2.76 years.

The poor inter-observer reproducibility could be explained by the different levels of experience of the two readers. Indeed, there is moderate intra-observer reproducibility with the more experienced physician, whereas, this value is poor with the novice. It is also observed that the mean difference between real bone ages and estimated bone ages is not greater than 3.4 years. This shows that the age estimations are highly reliable not only with dry bones, but also with virtual bones.

The application of CT to virtual anthropology is promising for the future. CT parameters need to be clearly defined and improved to obtain better reconstructions. In the study, the parameters were thoroughly tested so as to produce the most optimal visual results using VRT. The 3D reconstructions were of very high quality, but they can probably be refined. It should be kept in mind, however, that no matter how good the quality of a 3D image is, it remains virtual and, therefore, different from a real dry bone or a cast. It would be interesting to redefine the existing anthropological AAD techniques in order to make them applicable to virtual bones.

**Suchey-Brooks, Virtual Anthropology, Pubic Symphysis**