



Physical Anthropology Section - 2014

H85 Redefining Facial Soft Tissue Depth Landmarks for a Juvenile Australian Sub-Population: The Case of the Alar Curvature Point

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After attending this presentation, attendees will have been provided with an introduction to: (1) the error associated with the application of the current Alar Curvature point (AC) craniometric landmark definition; and, (2) the redefinition of this landmark for juveniles in an Australian sub-population using 3D multi-slice Computed Tomography (CT) clinical data.

This presentation will impact the forensic science community by addressing the issue of the current AC landmark definition not being applicable to all demographics. It will introduce novel definitions for locating this landmark in juveniles from an Australian sub-population. It will also demonstrate the value of clinical CT scans as alternative sources of contemporary population-specific skeletal data.

A major objective in forensic anthropology is victim identification, which often requires access to antemortem records. Unfortunately, comparative methods that utilize antemortem records such as DNA and dental comparison are not always successful or available. In these instances, facial approximations have been successfully applied as an initial recognition tool. The most common facial approximation method uses published soft tissue thicknesses at various craniometric landmarks to “build” the face onto the skull. It is therefore important to ensure that these landmarks are located as reliably as possible. For the most part, craniometric landmark location definitions translate well when locating them on juveniles. However, definitions that include fixed metrical values would be limited to the age demographic from which they were developed. The only existing definition for the AC landmark is described as being approximately 3mm lateral to the border of the nasal aperture, which has been utilized for adults and juveniles alike.¹

As part of a larger study dealing with facial soft tissue thicknesses, this study aimed to test the error rate associated with the current definition of the AC landmark. In addition to this, it aimed to create novel definitions with lower error rates that could be utilized with a higher degree of confidence.

Forensic anthropology in Australia has been limited by a lack of documented juvenile skeletal collections; however, access to CT data in a clinical setting overcomes this. For this study, the sample comprises retrospective cranial CT scans (resolution: 0.5mm/0.3mm) of 21 juveniles aged from birth to 2 years. These were obtained from the Mater Children’s Hospital, Brisbane.

Following the creation of 3D volume renderings of both bone and soft tissue, the Mid-Sagittal and Frankfurt Horizontal reference planes were constructed. The left and right AC landmarks were located on the skin surface according to the definition of being the most posterolateral position along the base of each nasal alar.² Points on the bony surface immediately posterior to the landmarks were added, and their position with relation to surrounding bony features was examined. Primarily, measurements from the Alare (Al) landmark on the lateral border of the nasal aperture to a parasagittal plane at the AC landmark (“X”) were taken to assess whether or not there was significant difference from the suggested 3mm distance.

Preliminary analysis was conducted and no significant bilateral asymmetry was discovered ($p>0.05$). Consequently, measurements were considered for the left side only. Two-tailed Student *t*-tests indicate that all lateral measurements were significantly different from the current definition of 3mm, with a mean error of 2mm. A comparison of the measurements to the new mean ($4.9\text{mm}\pm 1.3\text{mm}$) provided a smaller mean error of 0.6mm. “Y” measurements were also taken, to quantify the inferior position of AC in relation to Al ($3.8\text{mm}\pm 1.5\text{mm}$). During this presentation, novel definitions of the AC location will be presented for the 0-10 years of age cohort. Overall, the AC landmark can be locatable with a higher degree of confidence for facial approximations.

References:

1. Stephan CN, Simpson EK. Facial soft tissue depths in craniofacial identification (part II): An analytical review of the published sub-adult data. *J Forensic Sci* 2008;53:1273-9.
2. Kolar JC, Salter EM. Craniofacial anthropometry: Practical measurement of the head and face for clinical, surgical and research use. Springfield: Charles C Thomas, 1997.

Facial Approximation, Craniometric Landmark, Computed Tomography