F5 Sub-Adult Age Estimation From Three- Dimensional Imaging of the Cervical Spine

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After attending this presentation, attendees will have heard and seen results of investigations into the use of Cone Beam Volumetric Tomography (CBVT) of the cervical spine for age estimation in sub- adults.

This presentation will impact the forensic sciences community by offering a potentially more accurate method of age estimation for this age group. The purpose of this study is to investigate the use of CBVT for assessment of cervical vertebrae development as a viable method for age estimation.

The use of cone beam volumetric tomography has increased significantly since it was first introduced in the United States in 2001. Many orthodontic practices use this modality for comprehensive scans of the head and neck that include the cervical spine. Cephalometric images familiar to orthodontists can be created from the original scans. Orthodontists and others have used multiple methods to estimate developmental age including two dimensional cephalometric radiography of the cervical spine, analysis of hand-wrist development, and analysis of 3rd molar development.

A recent unpublished study at the University of Texas Health Science Center, San Antonio demonstrated that age estimation using analysis of third molar development with CBVT is more accurate than two-dimensional panoramic radiography.

A retrospective study of cases originally sent for routine assessment and reports of pathology was done. The cases selected were based on the type of CBVT machine used, an i-CAT manufactured by Image Sciences International. This was done in order to limit any possible variations in the scans created due to differences in acquisition techniques and reconstruction algorithms between the different cone beam machines. Cases selected were also limited to those taken using the large field of view (FOV), either a 16 cm (diameter) x 13 cm (height) or 16cm x 22cm. The main criterion, regarding size of FOV, was that the structures analyzed were easily readable within the scan. This was dictated by the variability in physical size of the patients who were scanned. Analysis of the vertebral structures was done using a single, third party software, InVivo Dental from Anatomage that was capable of both measurements and three dimensional renderings. The principle investigator was blinded as to the ages of the patients until after age estimation was completed. As in the two-dimensional radiographic technique, the cervical vertebrae assessed were C2, C3, and C4. The maturation and structural changes of these vertebrae were assessed and the age estimation made using standards originally established for the assessment of two dimensional cephalometric radiographs. This includes examination of the degree of concavity of the lower border of the vertebrae, the vertebral body height and width and the overall shape of the vertebral body (Roman, Palma, Oteo and Nevado, 2002). The estimated ages were then compared to the known chronological ages of the subjects. Statistical analysis of the results will be reported.

The use of three-dimensional imaging using CBVT of the cervical spine is an accurate and reliable method for estimating the developmental and chronological ages of sub-adults.

Age Estimation, Three Dimensional Imaging, CBVT

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