



F31 Advanced Dental Imaging as an Adjunct to Dental Age Estimation - A Comparison of Panoramic Radiography and Cone Beam Computed Tomography Assessment of Third Molar Development

Joanne Ethier, DMD, MBA, University of Texas Health Science Center, PO Box 29741, San Antonio, TX 78229; Robert Langlais, DDS, MS, and Marcel Noujeim, BDS, MS, University of Texas Health Science Center, Dental School, 7703 Floyd Curl Drive, San Antonio, TX 78229 ;and Thomas Prihoda, PhD, University of Texas Health and Science Center, Department of Biostatistics, 7701 Floyd Curl Drive, San Antonio, TX 78229; and David R. Senn, DDS, 18 Villa Jardin, San Antonio, TX 78230-2749*

The goal of this presentation is to investigate the role of advanced imaging, using Cone Beam Computed Tomography (CBCT) to aid in determining the stages of third molar development. The technique will be compared to a conventional technique using panoramic radiography.

This presentation will impact the forensic science community by reaching better accuracy in the assessment of the developmental stages of roots.

Forensic dentists make chronological age estimates based on the stages of crown development, root development and apical apices closure of the teeth roots. In cases involving age assessments for immigration agencies, the third molar root apex closure is most often evaluated. These estimates are based on data from the studies of Demirjian (1973) and Mincer (1993) and the use of conventional radiographic images. Estimates based on third molars necessarily have large ranges (+/- 4 years) as the third molar is the most variable of all teeth in development. Advances in imaging and more discriminate staging may improve the technique and narrow those ranges. Even though panoramic images are the primary image source for assessing apex formation, the projection geometry and nature of panoramic image formation with its inherent layering of anatomical structures and distortion, make accurate assessment problematic. Panoramic imaging has many advantages in terms of time required, decreased radiation dosage to the patient, wide area of coverage, comfort to the patient, ease of infection control and cost effectiveness to reach a radiographic view of the teeth and their supporting structures. However, with the development of advanced imaging and multiple plane reconstruction, a more accurate assessment of the development of dental structures, can be achieved. This could result in better accuracy in the assessment of the developmental stages of the teeth including third molars.

The aim of this study is to investigate the role of advanced imaging, using Cone Beam Computed Tomography (CBCT) to aid in determining the stages of third molar development. The technique will be explained and contrasted to a conventional technique using panoramic radiography.

For this prospective study, Institutional Review Board approval of use of human subjects was previously obtained. The subjects consisted of patients being evaluated for 3rd molars extractions and/or orthodontic treatments. Both the departments of Orthodontics and/or Oral Surgery Department of the Graduate Dental Clinic were solicited for referrals. The population ranged in age from 14 to 19 years old. The panoramic and CBCT images were acquired by the residents of the Graduate Program in Oral and Maxillofacial Radiology of the University of Texas Health and Science Center at San Antonio. The digital panoramic images were acquired with the Planmeca Promax. During the same appointment, using the high resolution Morita Accuitomo 3DX, two additional CBCT were acquired for each subject. Demographic information was recorded from the dental record and the added information sheet provided with the consent form. The age estimation was made by using the Demirjian/Mincer stages of the third molar development for the panoramic images and the three dimensional CBCT images.

Advanced imaging and cross sectional reconstruction of the CT volumes should offer better information about the position of teeth and their relationship to anatomical landmarks that may eventually become valuable in clinical dentistry and in forensic identification. Information gleaned about apical development of the third molars is expected to prove to be superior to panoramic radiography.

Age estimation by means of tooth development assessment from conventional radiographic images has been in used for many years. While CBCT is becoming more recognized as a powerful additional tool for diagnosis and treatment in all areas of dentistry, it is still considered to be an emerging technology. The standard of care and the guidelines for best practices challenge forensic dentists to be prepared to use all available techniques to reach the most accurate conclusions. Cone Beam Computed Tomography is a promising "new" technique that allows practitioners of clinical and forensic dentistry views of anatomical features never before possible.

Age Estimation, Cone Beam CT, Forensic Odontology