F34   Cone Beam CT Radiography for Dental Identifications

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After attending this presentation, attendees will gain an understanding of Cone Beam CT techniques and possible forensic dental uses.

This presentation will impact the forensic community by demonstrating a new method in dental odentifications.

Cone Beam Computed Tomography (Cone Beam CT) is a relatively new dental digital dental radiographic imaging technique that is rapidly gaining a place in dental diagnosis and treatment planning, and shows unlimited possibilities for future use. The essence of the technique relies on multiple skull or maxillofacial exposures onto a digital sensor plate taken from 360 degrees of rotation about the subject which is then synthesized by relational software into numerous possible viewing aspects simulating a medical CT Scan but at a much lower dose and cost to the patient.

In medical CT Scans, the beam is collimated to be thin and fan-shaped and slowly scans down through the patient (from head to toe) at ninety degrees to the body, one layer at a time. This induces a large amount of x-radiation exposure to the patient. Cone Beam CT, however, produces pulses of radiation exposing the patient with a beam shaped similarly to that used in exposing a cephalometric radiograph producing approximately 300 images around the patients head. Even though the exposure rotation time may be 20 seconds, the pulsed radiation exposure time to the patient may only be 4-6 seconds in duration. Therefore, a 20 second Cone Beam CT scan may induce a dose as low as 68 micro-sieverts whereas a traditional complete mouth radiographic series of intraoral radiographs induces a dose of 150 micro-sieverts compared to the dose of a Medical CT dose of 1200- 3300 micro-sieverts.

The robust amount of scanned information from all possible angles allows the practitioner to select multiplanar slices in three planes: axial, sagittal, and coronal. The slices may also be selected from 0.25 mm to 150.0 mm in thickness. Thus, traditional plane film images may be selected after-the-fact such as a panoramic view, cephalometric views, TMJ projection views (both lateral and antero-posterior), PA skull views, sialography examinations, and submentovertex views. Cone Beam machines with the capability of producing an extended field of view (typically 22 mm vertically) can also be used for airway assessments to be used with sleep apnea patient studies.

However, new image modes are also allowed by the scan by producing selectable axial images (as if looking down onto the selected plane from above), cross-sectional images (as if looking onto a segment of the mandible or maxilla cut at 90 degree angles) and also 3D images of the entire skull or orofacial complex. In fact, three dimensional models have been rendered from the single scan of a Cone Beam CT unit, eliminating the need of utilizing impressions and plaster pour-ups. Also, all Cone Beam CT images are displayed without distortion at a consistent 1:1 or life- sized ratio. The system also eliminates "ghost" image artifacts seen routinely with panoramic radiography which are superimposed on the actual radiographic anatomy and often hinders radiographic diagnosis.

This presentation will involve a "real time" demonstration of the Cone Beam CT imaging software and will suggest possible new methods of performing dental identifications and possibly bite mark analysis and comparison using this new and promising imaging technique.

Cone Beam, CBCT, Dental Identification