

The Effect of Varying Cone Beam Computed Tomography Image Resolution and Field-of-View Centralization on the Effective Radiation Dose

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Abstract : Introduction: Estimating the potential radiation risk for a widely used imaging technique such as cone beam CT (CBCT) is crucial. The aim of this study was to examine the effect of varying two CBCT technical factors, the voxel size (VOX) and the Field-of-View (FOV) centralization, on the radiation dose. Methodology: The head and neck slices of a RANDO® man phantom (Alderson Research Laboratories) were used with nanoDot™ OSLD dosimeters to measure the absorbed radiation dose at 25 predetermined sites. Imaging was done using the i-CAT® (Imaging Science International, Hatfield, PA, USA) CBCT unit. The VOX was changed for every three cycles of exposures from 0.2mm to 0.3mm and then 0.4mm. Then the FOV was centered on the maxilla and mandible alternatively while holding all other factors constant. Finally, the effective radiation dose was calculated for each view and voxel setting. Results: The effective radiation dose was greatest when the smallest VOX was chosen. When the FOV was centered on the maxilla, the highest radiation doses were recorded in the eyes and parotid glands. While on the mandible, the highest radiation doses were recorded in the sublingual and submandibular glands. Conclusion: Minor variations in the CBCT exposure factors significantly affect the effective radiation dose and thus the radiation risk to the patient. Therefore, extreme care must be taken when choosing these parameters especially for vulnerable patients such as children.

Keywords : CBCT, cone beam CT, effective dose, field of view, mandible, maxilla, resolution, voxel

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