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Dose reduction using the dexshield™ rectangular collimator in dental radiography

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Background: Rectangular collimation has been recommended by both the ADA and the NCRP to significantly reduce patient exposure to ionizing radiation. Various types of rectangular collimation devices have been devised, but the dose reduction to various organs of the head and neck and overall total dose reduction has not been evaluated.

Objective: To provide dosimetric data on four bitewing X-ray exposures to head and neck organs of a female CIRS anthropomorphic phantom using round and rectangular (DEXshield™) collimation for digital imaging.

Methods and Materials: Dose measurements were obtained using Optically Stimulated Luminescent (OSL) dosimeters placed in pre-manufactured slots at the location of 27 head and neck anatomic structures of an anthropomorphic female CIRS phantom. The phantom had removable cutouts for bilateral placement of a digital sensor at the bitewing level. Four bitewing radiographs were acquired using a Gendex 765 X-ray machine (65 kVp, 7 mA) at three settings (0.08, 0.32, and 0.80 seconds) using round and rectangular (DEXshield™) collimation. All exposures were repeated 15 times for each of the four bitewing exposures (60 repititions). The results were divided by 60 to evaluate the average dose. The organ fractions irradiated were determined from ICRP-89 reference phantoms according to age. kVp factors and ICRP-103 tissue weighting factors were also applied.

Results: Overall, an average of between 28-47.5% dose reduction when using the shield. The highest reductions for all exposures were for the eyes, cranium and brain. The 0.08 second exposure yielded the highest dose reduction and the 0.80 second exposure the least reduction.

Conclusion: Our data indicated that the DEXshield™ significantly reduced unnecessary radiation dose to organs of the head and neck. The OSL's are highly sensitive to low radiation dose measurements and are easy to use.

Conflict of Interest: This study was supported by a grant from Imaging Sciences International.

Biography

Dr. Iryna Branets is a Clinical Educator, Department of Cariology and Comprehensive care, NYU College of Dentistry , New York . Past Instructor and assistant professor. She is a member of American Dental Association, American Academy of Oral and Maxillofacial Radiology and the American academy of Facial Esthetics. She has over ten articles published in peer reviewed journals and over ten published abstracts. She is on the editorial board of several dental journals. Also a co-investigator in radiology grant

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