

8th International Conference and Exhibition on

Dentistry & Oral Care

April 18-20, 2016 Dubai, UAE



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Pediatric panoramic and cephalometric exposure to organs of the head and neck

Background: Very little research has been performed using anthropomorphic juvenile phantoms and Optically Stimulated Luminescent dosimeters to measure the absorbed doses and energy imparted to children during panoramic and cephalometric radiographic examinations of children.

Objectives: To measure juvenile patient radiation dose to the organs of the head and neck during digital panoramic and cephalometric radiography.

Methods & Materials: Two juvenile anthropomorphic CIRS phantoms 5 yr old and 10 yr old were filled with Optically Stimulated Luminescent dosimeters at 21 head and neck organ sites. An Instrumentarium OP100D orthopantomograph was used to expose the phantoms at 73kVp, 6.4mA and 16.8 s for panoramic imaging and at 85kVp, 12mA, and 17.6s for cephalometric imaging. The effective radiation dose was calculated for all the organs of the head and neck. Organ fractions irradiated were determined from ICRP-89. Organ equivalent doses and overall effective doses (micro Sieverts) were based on either one panoramic view or one cephalometric view and the ICRP-103 tissue weighting factors.

Results: Overall measured organ doses were higher for the 5 yr old than the 10 yr old for both the panoramic and the cephalometric imaging. The highest doses seen were in the glands, extrathoracic airway and the oral mucosa. The organ equivalent dose in micro Sieverts also yielded similar results. The effective dose in micro Sieverts for the 5 yr old was 27.8 (pan) and 6.5 (ceph), while the 10 yr old results were 26.3 (pan) and 3.8 (ceph).

Conclusions: This was the first study to evaluate radiation exposure to juvenile CIRS phantoms using OSL dot dosimetry in conjunction with panoramic and cephalometric imaging to provide organ equivalent doses and overall effective dose for 10 yr and 5 yr olds based on ICRP-103 tissue weighting factors.

Biography

Arthur Goren is a Clinical Professor in the Department of Cardiology and Comprehensive Care, NYU College of Dentistry and Clinical Associate Professor, Department of Prosthodontics and Digital Technology, SUNY Stony Brook School of Dental Medicine. He is also past Director of Radiology at SUNY Stony Brook School of Dental Medicine. He is a Fellow of the American Academy of Oral and Maxillofacial Radiology and has published numerous papers in the field of Radiology. He is also a Reviewer in Radiology for several peer reviewed journals. He has lectured both nationally and internationally.

Iryna Branets, DDS is a Clinical Educator in the Department of Cariology and Comprehensive Care, New York University College of Dentistry. Dr. Branets graduated from the Medical University, Ivano-Frankivsk, Ukraine and New York University College of Dentistry. Dr. Branets is a member of the American Dental Association, American Academy of Oral and Maxillofacial Radiology and the American Academy of Facial Esthetics. Research interests are radiation dosimetry, radiation dose reduction and radiation image quality.

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