

Theodorakou C, Pauwels R, Walker A, Bogaerts R, Howard K, Jacobs R, Horner K, The SEDENTEXCT Project Consortium (2009) "A survey of organ and effective doses for seven dental cone beam computed tomography (CBCT) units" presented as a poster at the 17th International Congress of Dentomaxillofacial Radiology 28 June - 02 July, 2009 Amsterdam, The Netherlands

A survey of organ and effective doses for seven dental cone beam computed tomography (CBCT) units

Theodorakou C^{1,2}, Pauwels R³, Walker A¹, Bogaerts R⁴, Howard K¹, Jacobs R³, Horner K², The SEDENTEXCT Project Consortium⁵.

¹North Western Medical Physics, The Christie NHS Foundation Trust, Manchester, UK; ²School of Dentistry, University of Manchester, UK; ³Oral Imaging Centre, School of Dentistry, Oral Pathology and Maxillofacial Surgery, Faculty of Medicine, Catholic University of Leuven, Belgium; ⁴Department of Experimental Radiotherapy, University Hospital Gasthuisberg, Katholieke Universiteit Leuven, Belgium ⁵Listing of partners on www.sedentexct.eu

Introduction

Dental CBCT has been associated with higher radiation risk compared to conventional dental imaging and lower radiation risk compared to multi-slice CT (MSCT). Several studies have reported on radiation doses but the number of TLDs and the range of CBCT units used were rather too limited to provide an accurate estimation of the radiation risk.

Objectives

The objective of this study is to measure the organ (OD) and effective doses (ED) for seven dental CBCT units.

Materials and methods

Radiation absorbed doses were measured using two adult ART head and neck phantoms using a large number of thermoluminescent dosimeters (TLD-100 and TLD-100H) positioned at the most radiosensitive organs for seven CBCT. Correction factors were applied to the skin and red bone marrow absorbed doses for each phantom slice to account for the fraction of the total mass of the specified organ in the phantom. The EDs were calculated using the ICRP 103 tissue equivalent factors.

Results

The average ODs for brain, salivary glands, thyroid, red bone marrow and skin were 0.13 mGy, 1.52 mGy, 0.48 mGy, 0.02 mGy and 0.02 mGy respectively. The salivary glands and the skin received the highest and lowest absorbed doses respectively. PlanmecaProMax 3D and Scanora 3D exhibited the highest and lowest effective dose respectively. The wide range in the EDs for the same clinical examination can be attributed to the different exposure conditions set by the different manufacturers.

Conclusions and discussion

This study reported and compared organ and effective doses for seven dental CBCT units. In addition, this study confirmed that CBCT radiation doses are one-twentieth of published MSCT

radiation doses but four times higher than the average panoramic dose published by the Health Protection Agency (UK).