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Entrance skin dose measurements in dental CBCT

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Introduction

Dental cone beam CT (CBCT) has been subject to a number of radiation dose evaluations. However, effective dose estimations on anthropomorphic phantoms, or dose quantifications such as the dose-area product, cannot be directly translated to an individual patient.

Objectives

To estimate patient skin dose for CBCT examinations, which can aid in the estimation of effective dose for subsets of patients, and in the determination of dose reference levels (DRLs) for dental CBCT.

Materials and methods

Patient selection was based on age, body mass index (BMI) and craniofacial distances within standard ranges. Ethical approval and informed consent were obtained. Five groups of common radiographic indications were determined, taking ten patients per indication. Eight thermoluminescent dosimeters (TLD-100) were attached on the patient’s face and neck. Two TLDs served to capture the background dose. Patients were scanned on the Scanora® CBCT, using the default scanning protocol for the particular indication. Furthermore, entrance dose was measured on the Alderson RANDO and Alderson Radiation Therapy (ART) phantoms to verify the consistency of the entrance dose measurements in standard conditions.

Results

Average skin absorbed doses per patient varied between 345µGy and 1552µGy with a mean value of 879µGy. The highest radiation doses were received in the area of the mouth (2057µGy) and the salivary glands (1173µGy (parotid glands) and 1051µGy (submandibulary glands). The lowest mean absorbed dose was perceived in the thyroid area (156µGy) and the eyes (136µGy). Average skin absorbed dose for the RANDO phantom was 759µGy; for the ART phantom it was 846µGy.

Conclusions and discussion

Skin dose values are influenced by a number of factors, which can be device-, operator and patient-dependent. When coupled with phantom dose measurements, dose simulations or dose-area product values, in vivo dose measurements can aid in the estimation of the effective dose for an individual patient.