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Estimation of organ absorbed dose in pediatric chest X-ray examination: A phantom study

By: **Jamal, NHM** (Jamal, Nurul H. M.)^[1]; **Sayed, IS** (Sayed, Inayatullah S.)^[1]; **Syed, WS** (Syed, Waliullah S.)^[2]

RADIATION PHYSICS AND CHEMISTRY
Volume: 166
Article Number: 108472
DOI: 10.1016/j.radphyschem.2019.108472
Published: JAN 2020
Document Type: Article; Proceedings Paper
[View Journal Impact](#)

Conference

Conference: 2nd AMDI International Oncology and Medical Physics Symposium
Location: Penang, MALAYSIA
Date: MAR 01, 2019
Sponsor(s): AMDI

Abstract

Children have a greater risk of developing lifetime cancer and other biological effects from ionizing radiation exposure than adults. The aim of this study was to measure the absorbed dose received by lungs and heart in pediatric chest X-ray examination using nanoDot optically stimulated luminescent dosimeter (OSLD). The X-ray system, Siemens Multix Top was used. A pediatric phantom developed by using beeswax and polyurethane foam was exposed at 50 kVp, 52 kVp, 55 kVp, 57 kVp and 60 kVp, with fixed tube current-exposure time (3 mAs), which is normally used in pediatric clinical chest X-ray examinations. The nanoDot OSLDs were placed in different parts in the thorax of the phantom according to the position of organs in the chest area, which are lungs and heart. For lungs, absorbed dose measurement nanoDot OSLDs were placed in the apex and base at three different depths. The phantom was exposed three times for each kVp value, and the absorbed doses were measured in mGy. The findings show that the measured absorbed dose to the heart increased with the increase in kVp. Overall, a 22% increase in absorbed dose to heart and a 29% increase in lungs with the increase in kVp was recorded. In addition, absorbed dose to the base of left and right lungs was recorded higher up to 9% as compared to the apex of lungs. In conclusion, the absorbed dosage increases with exposure, while the absorbed dose decreases with depth. It is necessary for the radiographer to select an appropriate exposure setting based on the physical characteristics of the pediatric patient.

Keywords

Author Keywords: Absorbed dose; Chest X-ray; Pediatrics; Phantom; OSLD
KeyWords Plus: TISSUE-EQUIVALENT MATERIALS; BEESWAX; CONSTRUCTION

Author Information

Reprint Address: Sayed, IS (reprint author)

+ Int Islamic Univ Malaysia, Dept Diagnost Imaging & Radiotherapy, Kulliyah Allied Hlth Sci, Jalan Sultan Ahmad Shah, Kuantan 25200, Pahang, Malaysia.

Addresses:

+ [1] Int Islamic Univ Malaysia, Dept Diagnost Imaging & Radiotherapy, Kulliyah Allied Hlth Sci, Jalan Sultan Ahmad Shah, Kuantan 25200, Pahang, Malaysia

+ [2] Univ Sains Malaysia, Sch Hlth Sci, Hlth Campus, Kota Baharu 16150, Kelantan, Malaysia

E-mail Addresses: inayatullah@iium.edu.my

Funding

Funding Agency	Grant Number
International Islamic University Malaysia (IIUM), Malaysia through Research Initiative Grant Scheme, RIGS	16-302-0466

[View funding text](#)

Publisher

PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND

Journal Information

Impact Factor: [Journal Citation Reports](#)

Categories / Classification

Research Areas: Chemistry; Nuclear Science & Technology; Physics

Web of Science Categories: Chemistry, Physical; Nuclear Science & Technology; Physics, Atomic, Molecular & Chemical

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