Sudan University of Science and Technology

College of Graduate Studies

Effective dose estimation during pediatric chest X ray radiography

تقدير الجرعة المؤثرة للاطفال في فحص الصدر

A thesis submitted in partial fulfillment for the requirements of Master degree in Medical Physics

By:

Omer Osman Omer Mohammed

Supervisor

Dr.Abdelmoneim Adam Mohamed Sulieman

Associate Professor

February 2011

Dedication

To:

My parent for their patience and encouragement

My brothers, sisters and teachers for their help and support

My friends for their valuable supports

I dedicate this work

Acknowledgment

I wish to express my sincere appreciation to Dr. Abdelmoneim Adam Mohamed Sulieman, Sudan University of science and technology for his valuable guidance fruitful discussion, comment and supervision through this work.

My appreciation to SAEA in and the Institute of Radiation Protection (IRD) and to the medical physics head department for their keen interest and necessary assistance during the practical work

Many thanks for the staff of the Diagnostic Radiology Departments at G.IB.Noeaf and

Mohammed alamen hospitals .

My thanks extended to everyone who helped me in different ways to make this work possible. Finally I would like sincerely thanks to my brother Dr Mohammed Osman for his help and encouraged and my lovely

Table of contents

List of tables

List of figures

Abstract:

Radiation doses to patients from chest X ray radiography which is the most common paediatric X-ray examinations were studied in two hospitals (MO) and (IB) in Khartoum state, Sudan. Entrance surface dose (ESD) was determined from exposure settings using DosCal software. Totally, 126 patients were included in this study. Mean ESDs obtained from for pediatric chest radiography in (MO) hospital recorded in this work was 0.049, 0.058, 0.100 and 0.054 mGy for the patients aged between 0-1, 1-3, 3-5 years and total sample respectively, and was 0.031 mGy for aged group in (IB) hospital .

The mean ESDs per chest radiographic image ranged between 0.054 and 0.031 mGy in (Mo) and (IB) respectively per exposure, which is slightly lower than the corresponding values reported in the DRLs reported in European guidelines on quality criteria for diagnostic radiographic images EUR 16260EN As demonstrated in the discussion, patients' doses were high in departments using single-phase generators compared with those using constant potential. The results presented will serve as a baseline data needed for deriving reference doses for pediatrics X-ray examinations in Sudan. The mean organ equivalent dose assessed from ESDs measured values for (MO) and (IB) using CHILDOSE (NRPB-SR279) to lung, breast, thyroid, liver, kidney , bladder, stomach and testis was 0.021, 0.039, 0.026, 0.013, 0.002, 0.006, 0.0013 and 0.00001 *mSv* for (MO) , 0.0120, 0.0293, 0.0149, 0.0076, 0.012, 0,0034, 0,074 and 0.0000076 *mSv* for (IB) respectively. The overall effective dose obtained from this study 0.0092 and 0.0053 mSv for (MO) and (IB) respectively.

الملخص

الاستخدام الطبي للاشعة السينية هو من اكبر مصادر تعرض الانسان للاشعاع في الوقت الحاضر.لذلك يجب تجنب استخدام الاشعاع بصورة مفرطة او بجرعات اعلي مما هو مطلوب لعمل الفحص المحدد. مؤخرا، زاد الاهتمام بمخاطر الاشعاع وخاصة السرطان نتيجة للتعرض الطبي للاشعاع.

هدفت هذه الدراسة الي قياس الجرعة الاشعاعية للمرضي اثناء فحوصات الاشعة العادية لمستشفيين بولاية الخرطوم. لتقدير الجرعة المكافئة للاعضاء المختلفة وكذلك الجرعة المكافئة وتقدير خطر الاشعاع الناجم عن فحوصات الصدر للاطفال بواسطة الاشعة السينية . قيست الجرعة الاشعاعية باستخدام جهاز انفورس (Unfors) .

تم قياس جرعة الاشعاع لعدد 126 مريض في كل من المستشفيات الاتية: محمد الامين – ام درمان و مستشفى جعفر ابنعوف للاطفال .

خلصت هذخ الدراسة الى ان الجرعات الاشعاعية للمرضي متقاربة مع الدراسات السابقة. هذه الدراسة توفر معلومات اساسية عن مستوي الجرعات الاشعاعية للمرضي بهذه المستشفيات. لوحظ ان هناك اختلاف كبير بين قيم الجرعات الاشعاعية للفحص الواحد. يعزي ذلك لاختلاف الاجهزة وطريقة الفحص بالاضافة الي كفاءة تقني الاشعة ووزن المريض . هذه الدراسة تؤكد علي اهمية برنامج ضبط جودة فعال في هذه المستشفيات ووضع مستويات مرجعية للاشعاع .