

Sudan University of Science and Technology
College of Graduate Studies and Scientific Research



Estimation of Patient's Effective Dose during Routine

Computed Tomography Examinations

تقدير الجرعة الفعالة للمريض أثناء فحوصات الأشعة المقطعية العادية

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

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قال تعالى:

(قُلْ سِيرُوا فِي الْأَرْضِ فَانظُرُوا كَيْفَ بَدَأَ الْخَلْقَ

ثُمَّ اللَّهُ يُنْشِئُ النَّشْأَةَ الْآخِرَةَ إِنَّ اللَّهَ عَلَى كُلِّ

شَيْءٍ قَدِيرٌ

العنكبوت الايه 20

Dedication

To doses of the cup blank to give me a drop of love

To those of the fingers to give us a moment of
happiness

To reap the thorns out of my way for me to pave the
way science

To heart the great my father.

Of whom breastfed me to love and compassion

Into a symbol of love and healing balm

To the heart as pure whiteness my parents

To my friends, And to all my family

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Deep thanks to my friend Finally, I would like to sincerely thank my family for their consistent mental support

Abstract

Computed tomography (CT), is an X-ray procedure that generates high quality cross-sectional images of the body, and by comparison to other radiological diagnosis, CT is responsible for higher doses to patients.

The radiation dose was measured in five hospitals in Khartoum state during (March 2012- July 2012) using different CT modalities. The radiation dose higher Al-amal, Royal scan and Al-zaytouna hospital than the other two hospitals while the radiation dose in Al-bugaa diagnostic center and Al-ribat university hospital the lowest. MSCT scanners 64 slice exposed patients to a higher dose than 16 slice scanners.

In this study, the mean effective dose for Al-Zaytouna hospital was 4.3 ± 1.7 mSv, 20.5 ± 6.6 mSv and 62.3 ± 32.5 mSv for the brain, chest and abdomen respectively. The mean effective dose for Royal scan hospital was 3.8 ± 1.4 mSv, 28.1 ± 36.5 mSv, 46.2 ± 34.2 mSv for brain, chest and abdomen respectively. The mean effective doses for Al Bugaa diagnostic center were 2.7 ± 1.4 mSv, 8.5 ± 3.4 mSv, 18.2 ± 13.1 mSv for brain, chest and abdomen respectively. The mean effective dose for Al amal diagnostic center was 3.2 ± 1.6 mSv, 12.5 ± 9.7 mSv, 36.9 ± 20.6 mSv for brain, chest and abdomen respectively. The mean effective dose for Al Ribat university hospital was 1.6 ± 0.9 mSv, 3.2 ± 1.8 mSv, 8.7 ± 5.7 mSv for brain, chest and abdomen respectively and the effective dose is median than that reported in previous studies.

ملخص البحث:

التصوير المقطعي (CT)، هو عملية التصوير بالأشعة السينية التي تنتج صور لمقاطع جسم المريض بجودة عالية، وبالمقارنة مع التشخيص الإشعاعية الأخرى، الاشعه المقطعية ذات جرعات اكبر للمرضى.

تم قياس الجرعة الإشعاعية للمرضى في خمسة مستشفيات في ولاية الخرطوم خلال الفترة (مارس 2012 - يوليو 2012) باستخدام تقنيات مختلفة من جهاز تصوير الاشعه المقطعية. وجدنا ان الجرعة الاشعاعية عالية في كل من مستشفى الزيتونة، مستشفى الأمل الوطني و مستشفى رويال مقارنة بالجرعة الاشعاعية من مستشفى البقعة ومستشفى الرباط الجامعي. جهاز الأشعة المقطعية متعدد الشرايح ذو 64 شريحة يعطي جرعة أعلى للمريض من جهاز الاشعة المقطعية ذو شريحة.

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في هذه الدراسة، كان متوسط الجرعة الفعالة للمرضى في مستشفى الزيتونة 4.3 ± 1.7 ملي سيفرت، 20.5 و $62.3 \pm 32.5 \pm 6.6$ mSv ملي سيفرت للدماغ والصدر والبطن على التوالي. وكان متوسط الجرعة الفعالة في مستشفى رويال اسكان 3.8 ± 1.4 ملي سيفرت، 28.1 ± 36.5 ملي سيفرت، 46.2 ± 34.2 ملي سيفرت عن الصدر، والدماغ والبطن على التوالي. وكانت متوسط الجرعة الفعالة في مركز البقعة التشخيصي 2.7 ± 1.4 ملي سيفرت، 8.5 ± 3.4 ملي سيفرت، 18.2 ± 13.1 ملي سيفرت في الصدر والدماغ والبطن على التوالي. وكان متوسط الجرعة الفعالة في مستشفى الأمل 3.2 ± 1.6 ملي سيفرت، 12.5 ± 9.7 ملي سيفرت، 36.9 ± 20.6 ملي سيفرت في الصدر والدماغ والبطن على التوالي. وكان متوسط الجرعة الفعالة في مستشفى الرباط

الجامعي 0.9 ± 1.6 ملي سيفرت، 1.8 ± 3.2 ملي سيفرت، 5.7 ± 8.7 ملي سيفرت عن الصدر،
والدماغ والبطن على التوالي والجرعة الفعالة لهذه الدراسة متوسطة مقارنة بالدراسات السابقة.

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List of abbreviation

CT	Computed tomography
UNSCEAR	The United Nation Scientific Committee on the Effects of Atomic Radiation
MSCT	multi-slice computed tomography
AEC	Automatic Exposure Control
CTDI	Computed tomography dose index
DLP	Dose length product
HRCT	High resolution contrast
CTU	Computed tomography urography