

**Sudan University of Science &
Technology
College of Graduate Studies**

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the Requirements of M.Sc Degree in Medical
Radiation Physics.**

**Evaluation of Quality Control Program for
CGR ALCYON Cobalt-60 Teletherapy
Machine**

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DEDICATION

To

My parents

With love

ACKNOWLEDGEMENT

I would like to express my great thanks and attribute to every one who supported me in this study; especially my colleagues in Radiation and Isotopes Center Khartoum

.(RICK

Full regardness for my supervisor Mr. Mamdouh Yassin who gave me perfect advices and ideas, in such way that

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ABBREVIATIONS

AAPM	American Association of physicist in Medicine
ACR	American College of Radiology
^{60}Ni	Nickel element
AECL	Atomic Energy of Canada Limited
CCW	Cross clockwise
CL	Confidence Level
Cm	Centimeter
CW	Clockwise
IEC	International Electro technical Commission
Max	Maximum
MeV	Mega electron volt
Min	Minimum
mm	Millimeter
n	Neutron
NCR's	Nuclear Regulatory Commission
NTCP	Normal Tissue Complication Probability
ODI	Optical Distance Indicator
PCS	Pattern of Care Study
QA	Quality Assurance
QC	Quality Control
RICK	Radiation and Isotope Centre of Khartoum
SDC	Source Distance Collimator
SD	Standard Deviation
SSD	Source Skin Distance
TCP	Tumor Control Probability
USA	United State of America
WHO	World Health Organization
β	Beta ray
γ	Gamma ray

ABSTRACT

For ^{60}Co machine, Quality Control (QC) may be defined as a program that periodically tests the physical parameters that affect the performance of machine and compares the results of such tests with some defined standards.

The importance of quality control program lies in the detection any minor changes in the equipment and have corrections made before these changes become significant enough to affect the quality of treatment or causing unnecessary radiation exposure to patients or staff.

The theoretical part of this study include historical background on the use of co-60 machine in radiotherapy, the construction of such machines as well as details of QC tests.

The practical part includes performance of QC test on a cobalt machine at radiation & isotopes centre (RICK) in Khartoum state as well as preparation and distribution of a questionnaire on this issue to gather more information about the qc program at RICK.

The performed QC tests were lamp indicator, door interlock, emergency off, table motion, audiovisual monitor, wedges, shield and shield tray, cross hair centering, gantry rotation, treatment stop timer, field size indicator and output consistency .

According to the obtained results it was clear that the tested machine suffers from a lot of problems both mechanical such as wedge, shield blocks, shield tray and field size accuracy. The output of the machine was found to be very low that made the treatment time to be excessively long.

At the end of this study some recommendations have been mentioned so as to improve the situation regarding the use of this equipment in radiation treatment.

الخلاصة

ضبط الجودة لجهاز الكوبالت-60 يعرف بأنه برنامج لإجراء إختبارات دورية للعوامل الفيزيائية التي تؤثر على أداء الجهاز ومقارنة نتائج هذه الإختبارات مع القيم المتنباه من بعض الجهات العلمية المعيارية.

أهمية ضبط الجودة تكمن فى أكتشاف أى خلل فى العوامل المؤثرة على إنتاج الإشعاع قبل أن يصل ذلك الخل الى الحد الذى يؤثر على دقة تنفيذ العلاج أو تعريض المرضى أو العاملين ألى جرعات غير مبررة.

الجانب النظرى فى هذه الدراسة إشتمل على خلفية تاريخية لإستخدام جهاز الكوبالت -60 فى العلاج وكذلك تفاصيل تركيب هذا الجهاز وتفاصيل إجراء قياسات ضبط الجودة عليه. الجانب العملى إشتمل على إجراء بعض إختبارات ضبط الجودة على أحد أجهزة الكوبالت -60 بالمركز القومى للعلاج بالأشعة والطب النووى والإختبارات هى قفل الباب, مفتاح الطوارئ, حركة الطاولة, جهاز المناداة والملاحظة, مكعبات الحماية, دوران الماكينة, مؤقت زمن العلاج, محدد حقل العلاج وخرج الأشعة .

أيضا وللوقوف على تفاصيل أكثر فيما يخص وضع برنامج ضبط الجودة بالمركز قمنا بإعداد وتوزيع إستبيان على العاملين بقسم الإشعة العلاجية بالمركز. استنادا لنتائج الاختبارات التي قام بها الباحث فإن جهاز الكوبالت وجد أنه يعانى من الكثير من المشاكل منها ميكانيكية وذلك فى الوتد العلاجي , مكعبات الحماية , حامل مكعبات الحماية , حجم الحقل العلاجي , جهاز التخاطب مع المريض كذلك فإن الجهاز يعانى من ضعف كبير فى خرجة .

فى نهاية البحث قدمنا بعض التوصيات والتي إذا تم الأخذ بها نعتقد بأنها ستساهم فى تقليل تأثير المشاكل التي تم رصدها بالجهاز على إستخدامة فى العلاج الإشعاعى..

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