الايـة

قال تعالي:

(أَوْ كَظُلُمَاْتٍ فِيْ بَحْرٍ لُّجِّيٍّ يَغْشَاْهُ مَوْجٌ مِنْ فَوْقِهِ مَوْجٌ مِنْ فَوْقِهِ سَحَاْبٌ ظُلُمَاْتٌ بَعْضُهَاْ فَوْقَ بَعْضٍ إِذَاْ أَخْرَجَ يَدَهُ لَمْ يَكُدْ يَرَاْهَاْ وَمَنْ لَمْ يَجْعَلِ اللّهُ لَهُ نُوْرَاً فَمَاْلَهُ مِنْ نُّوْرٍ)

صدق الله العظيم

(سورة النور)

Dedication

*I dedicate this research to **my family** …*

***…**To **my grandparents** whose spiritual will to pursue intellectual advancement provided me role models and confidence to pursue my own education and intellectual enrichment.*

*…To **my mother** whose support an academic and professional achievements served as my inspiration.*

*…To **my father** whose support, intellectual curiosity, encouragement, and literary exploits helped guide me through my academic and literary endeavors.*

*…To **my friends**, uncles and aunts for unconditional love and support provided me the sustenance I needed to complete this work.*

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Abstract

Motion during radiation treatment is consider as one of major challenges directly affect the treatment process and outcome. The general aim of this study was to measure the organ displacement caused by respiration specially in AP direction during radiotherapy of chest organ in order to predict the maximum and minimum margin of displacement caused by such problem in order to determine the radiotherapy target volume using Auto contouring process in GE-CT machines. Analytical case control study containing more than 150 patients with known case of ca. lung or ca. esophagus and normal cases underwent CT scan using GE 16-slice machine for purpose of diagnosis and preplanning of conventional radiotherapy treatment at diagnostic centers and RICK in period from 2017-2019. Single slice (using SMART-PREP) are taken at the center of the mass at constant time interval usually 2 second, then using auto-countering process the maximum diameter and volume of the organs were taken in both respiration and expiration process also the tumor displacement measured also the organs displacement considered because we need to study the effect of organ general motion in treatment process. Right, left lungs and esophagus volumes and diameters were major study variables. The result showed there were significant difference for diameters and volumes measurement between both respiratory cycle when paired sample t-test was conducted at ($p<0.05$, CL=95%), and the mean value of difference (displacement) in diameter was 2.6, 3.2 and 3.9mm for right, left lung and esophagus respectively where the mean volume equal 129.6, 99.9, 2.8cm^3 for inspiration and 127.2, 94.1, 2.9cm^3 for expiration respectively. This study was concluding that conventional radiotherapy treatment planning need precise determination of treatment filed in order to exclude as much as possible the normal tissue from the treatment field.

ملخص الدراسة

تعتبر الحركة أثناء العلاج الإشعاعي أحد التحديات الرئيسية التي تؤثر بشكل مباشر على عملية المعالجة ونتائجها. كان الهدف العام من هذه الدراسة هو قياس إزاحة الأعضاء الناتجة عن التنفس وخاصة في الاتجاه الامامي-الخلفي خلال العلاج الإشعاعي لاعضاء الصدر من أجل التنبؤ بحد أقصى وأدنى للإزاحة الناجم عن هذه المشكلة من أجل تحديد حجم الحقل الإشعاعي للعلاج باستخدام طريقة الكنتور التلقائي في آلات الاشعة المقطعية متعددة الكواشف من شركة جي اي. هذه دراسة تحليلية للسيطرة على الحالات تحتوي على أكثر من 150 مريض يعانون من حالة سرطانات الرئة أو المريء والحالات العادية الطبيعية لفحص الاشعة المقطعية للصدر. باستخدام آلة اشعة مقطعية من 16 كاشف لغرض تشخيص وتخطيط العلاج الإشعاعي التقليدي في مراكز التشخيص ومركز الخرطوم لعلاج الاورام في الفترة من يانايير 2017 وحتي اكتوبر 2019. تؤخذ شريحة واحدة باستخدام SMART-PREP في مركز الكتلة الورميه في فاصل زمني ثابت عادة 2 ثانية ، ثم باستخدام عملية مواجهة تلقائية تم أخذ الحد الأقصى لقطر وحجم الأعضاء في كل مرحلة من مراحل التنفس وأيضًا إزاحة الورم يقاس أيضًا تشريد الأعضاء نظرًا لأننا نحتاج إلى دراسة تأثير الحركة العامة للأعضاء في عملية العلاج. وكانت الرئتان اليمنى واليسرى وأحجام المريء وأقطارها متغيرات الدراسة الرئيسية. أظهرت النتيجة وجود اختلاف كبير في قياس الأقطار والأحجام بين كل من الدورة التنفسية عند إجراء اختبار t للعينة المقترنة عند مستوي ثقة 95% ونسبة خطا 5%، وكان متوسط قيمة الفرق (الإزاحة) في القطر 2.6 ،3.2 و3.9مم للرئة اليمنى واليسرى والمريء على التوالي حيث متوسط الحجم يساوي 129.6 ،99.9 ،2.8سم^3 للاستنشاق و127.2 ،94.1 ،2.9سم^3 للزفير. استنتجت هذه الدراسة أن التخطيط التقليدي للعلاج الإشعاعي يحتاج إلى تحديد دقيق للعلاج المقدم لاستبعاد أكبر قدر ممكن من الأنسجة الطبيعية من مجال العلاج.

List of abbreviations

2D	Two Dimensions
3DCT	Three Dimensional Computed Tomography
4DCT	Four Dimensional Computed Tomography
5FU	Five Fluorouracil
ANN	Artificial Neural Network
AP	Antro -Posterior
CBCT	Cone Beam Computed Tomography
CCD	Charged Coupled Device
CRT	Cathode Ray Tube
CT	Computed Tomography
DIBH	Deep Inspiration Breath Hold
DMLC	Dynamic Multileaf Collimators
DVFs	Deformation Vector Fields
DVH	Dose Volume Histogram
ECG	Electrocardiogram
EPID	Electronic Portal Imaging Device
FDG	Florodeoxyglucose
GTV	Growth Target Volume
IGRT	Image Guided Radiation Therapy
IMRT	Intensity Modulated Radiation Therapy
ITV	Irradiated Target Volume
KV	Kilo Voltage
LAT	Lateral Projection
MDCT	Multidetector Computed Tomography
MIP	Maximum Intensity Projection
MLC	Multileaf Collimator
MRI	Magnetic Resonance Imaging
NTCP	Normal Tissue Complication Probability
OAR	Organ At Risk
PET	Positron Emission Tomography
PTV	Planning Target Volume
QA	Quality Assurance
ROIs	Region Of Interest
RT	Radiation Therapy
SBRT	Stereotactic Body Radiation Therapy
SI	Superior Inferior
TCP	Tumour Control Probability
TV	Target Volume
U.S.	United State
US	Ultrasound
VEGF	Vascular Endothelial Growth Factor