Sudan University of Science and Technology

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Evaluation of Breast Prone Position Irradiation Dose

تقويم العلاج الاشعاعي لسرطان الثدي في الوضع البطني

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صدق الله العظيم

الايه (1) سوره الرحمن

Dedication

(This thesis is dedicated to my parents Mather and Father)

I thank
My husband Muntasir, for his love and support;
Osman and feras for bringing so much happiness into my life,
and for sleeping through the night before I did;
My parents, for their sacrifices that made this thesis possible.
Special thank to my mother Mona

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Abstract

The prone position can be used for the planning of adjuvant radiotherapy after conservative breast surgery in order to deliver less irradiation to lung and cardiac tissue. In the present study, we compared the results of three-dimensional conformal radiotherapy planning for 15patients irradiated in the supine and prone position used compared. Tumor stage was T2N0M0 in group of patients and T2N1M0 in other .All patients had been previously submitted to conservative breast surgery. Breast size was large in 15patients and moderate in 10and small in 5. Planning in the prone position was performed using an immobilization foam pad with a hole cut into it to accommodate the breast so that it would hang down away from the chest wall. Dose-volume histograms showed that mean irradiation doses reaching the ipsilateral lung were (8.3 ± 3.6) Gy with the patient in the supine position and (1.4 ± 1.0) Gy with the patient in the prone position .The values for the contra lateral lung were (1.3 ± 0.7) Gy in supine and (0.3 ± 0.1) Gy in prone and the values for cardiac tissue were (4.6 ± 1.6)in supine and (3.0 ± 1.7)Gy in prone, respectively. Thus, the dose-volume histograms demonstrated that lung tissue irradiation was lower with the patient in the prone position than in the supine position. Large-breasted women appeared to benefit most from irradiation in the prone position. Prone position breast irradiation appears to be a simple and effective alternative to the conventional supine position for patients with large breasts, since they are subjected to lower pulmonary doses which may cause less pulmonary side effects in the future.

الخلاصة:

الوضع البطني يُمْكِنُ أنْ يُستَعملَ لتخطيط علاج بالأشعةِ بعد جراحةِ الثدي الجزئيه لكي نعطي أقل جرعه إلى الرئـةِ والنسيج القلبي.اجريت الدراسةِ في المركز القومي للعلاج بالاشعة والطب النووي في الفترة مابين يوليو الي سمبتمر 2009 تمت مقارنه نَتائِجَ العلاج بالأشعةِ الثلاثي الأبعادِ بتُخطيطُ خمسة عشر مريض خطط وعولج افتراضيا في الموقع المنبطح والوضع البطني. مرحلة الورمِ كَانتْ T2N0MO في مجموعةِ المرضى وT2N1M0 في آخرينِ كُلّ المرضى كَانوا قدْ اجروا جراحةِ صدرِ جزئيهِ سابقاً. حجم صدرِ كَانَ كبيرَ في 8 مريضِ ومعتدلِ في 5 وصغير في 2. التخطيط في الوضع البطني بواسطة إستعمال ملحق خاص به فتحة قطعت فيه لإسْكان الصدر لكي يتَدلّي بعيداً عن حائطِ الصدرَ. مدرج حجمِ جرعةِ الإحصائي يظهر ان جُرَعِة الاشعه المتوسطةِ التي تَصِلُ للرئة المجاوره للثدي المصاب مَع المريضِ في الموقع المنبطح =8.3±3.6 وحدة بينما تساوي =1.4± 1.0 وحدة مع المريض في الوضع البطني, القيم الخاصه بالرئة المقابله للثدي المصاب =1.3± 0.7 وحدة في الوضع المنبطح بينما 0.3 ±0.1 وحدة في الوضع البطني ,القيم الخاصة بالنسيج القلبي =4.6± 1.6 وحدة في الوضع المنبطح و3.0± 1.7 وحدة في الوضع البطني على التوالي,هكذا بين مدرج حجم الجرعه الاحصائي بان الجرعه الممتصه في النسيج الرئوي المجاور كانت اقل بكثير في الوضع البطني منه في الوضع المنبطح , بالاخص في المريضات ذوات الصدور الممتله والكبيرة نسبيا حيث اظهرت الدراسة انه من الافضل علاجهم في الوضع البطني لما في ذلك من تقليل للجرعة الواصلة للرئة مما يقلل الاثار الرئوية الجانبية في المستقبل .

List of Abbreviations

AP	Anterior-Posterior direction
BCSS	Breast cancer-specific survival
Ca	Cancer; carcinoma
CT	Chemotherapy
CTV	Clinical target volume
CTV	Clinical Tumor Volume
CLD	Central Lung distance
DVH	Dose Volume Histogram
DWH	Dose Wall Histogram
FS	Field Size
GTV	Gross target volume
Gy	Grays (units of radiation)
HDT	High-dose therapy
ITV	Internal target volume
IMRT	Intensity Modulated Radiation Therapy
IPTV	Internal Planning Target Volume
ICRU	International Commission on Radiation Units
IBV	Ipsilateral breast volume
IM	Internal Margin
LN	Lymph Node
Lx	Lumpectomy
M	Metastases
MTD	Maximum tolerated dose

MHD maximum heart distance

N Regional lymph nodes

PTV Planning Target Volume

RTOG Radiation Therapy Oncology Group grading system

SM Setup Margin

T Primary tumor

TPS Treatment Planning System

TV Target volume

TBI Total body irradiation

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Symbols

D mean	Mean treatment dose
MLD	Maximum lung dose
T	Total time of treatment (days)
Δλ	photon wavelength
λ c	Compton wavelength of the electron
*E*K	kinetic energy
LET	Linear energy transfer
Nj	Number of portal images
Npat	Number of patients in a particular study
Nz	Number of slices in CT image set
3DCRT	Three dimensional conformal radiother**apy**
Z	Atomic number
q	Scattering angle
H2O+	water ion