Accelerated partial breast irradiation using 3D conformal radiation therapy versus whole breast irradiation in patients with early breast cancer.

Thesis

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List of Abbreviations

AC	**doxorubicin plus cyclophosphamide**
ADH	**Atypical Ductal Hyperplasia**
AIs	**Aromatase inhibitors**
ALH	**Atypical Laboular Hyperplasia**
ALND	**Axillary lymph Node Dissection**
APBI	**Accelerated Partial Breast Irradiation**
BCS	**Breast-Conserving Surgery**
BCT	**Breast Conservative Therapy**
BIRADS	**Breast Imaging Reporting and Data System**
BMI	**Body Mass Index**
BOOP	**bronchiolitis obliterans organizing pneumonia**
BRCA	**Breast Cancer gene**
BSE	**Breast Self-Examination**
CALGB	**Cancer and Leukemia Group B**
CALGB	**Cancer And Leukemia Group B**
CBE	**Clinical Breast Examination**
CI	**conformity index**
CI	**confidence interval**
CIA	**Chemotherapy Induced Amenorrhea**
CMF	**Cyclophosphamide, Methotrexate, and 5-fluorouracil**

CT	**Computed Tomography**
CTV	**clinical target volume**
DCIS	**Ductal Carcinoma In Situ**
DFS	**Disease Free Survival**
DFS	**Disease Free Survival**
DRRs	**digitally reconstructed radiographs**
DVH	**Dose Volume Histogram**
EBCTCG	**Early Breast Cancer Trialists' Collaborative Group**
ECG	**echocardiography**
ECOG	**Eastern cooperative oncology group**
EORTC	**European Organization for Research and Treatment of Cancer**
ER	**Estrogen receptor**
FAC	**5-Fluorourcil,Doxorubicin, Cyclophosphamide**
FDG	**Fluorodeoxyglucose**
FEC	**5-Fluorouracil, Epirubicin, Cyclophosphamide**
FNA	**Fine needle aspiration**
GOC	**Gloucestershire Oncology Centre**
GTV	**gross tumor volume**
HER2	**Human Epidermal Growth Factor Receptor 2**
HR	**Hazard Ratio**
HS	**Highly significant**
IBCSG	**The International Breast Cancer Study Group**

IBCSG	**International Breast Cancer Study Group**
ICRU	**International Commission on Radiation Units and Measurements**
ICRU	**International Commission of Radiation Units**
IDC	**Invasive Ductal Carcinoma**
ILC	**Invasive Lobular Carcinoma**
IM	**internal margin**
IMN	**Internal Mammary lymph node chain**
IMRT	**intensity-modulated radiotherapy**
INT trial	**InterGroup Trial**
IQR	**interquartile range**
ISL	**International Society of Lymphology**
ITV	**internal target volume**
IV	**The Irradiated volume**
Ki67	**Proliferative activity**
LCIS	**Lobular Carcinoma In Situ**
LHRH	**Luteinizing hormone-releasing hormone**
LQ	**linear-quadratic**
LR	**Local Recurrence**
LT	**Left**
LVEF	**left ventricular ejection fraction**
M	**Distant Metastases**
MF	**Methotrexate and 5-fluorouracil**

MLC	**multileaf collimators**
MLD	**Mean lung dose**
MRI	**Magnetic Resonance Imaging**
N	**Regional Lymph Nodes**
NAC	**nipple-areola complex**
NCCN	**National Comprehensive Cancer Network**
NCI	**National Cancer Institute**
NCI	**National Cancer Institute**
NOS	**Not otherwise specified**
NS	**Non Significant**
NSABP	**National Surgical Adjuvant Breast and Bowel Project**
NSD	**Nominal Standard Dose formula**
OAR	**organs at risk**
OCOG	**Ontario Clinical Oncology Group**
OFS	**Ovarian function suppression**
OS	**overall survival**
PAB	**Posterior axillary boost**
PET	**Positron Emission Tomography**
pN	**Pathologic Lymph Nodes**
PR	**Progesterone Receptor**
PRV	**planning organs at risk volume**
pT	**Pathological Tumor size**

PTV	**Planning target volume**
PVI	**Perivascular Invasion**
RILI	**radiation-induced lung injury**
RMH	**Royal Marsden Hospital**
RMH/GOC	**UK Royal Marsden Hospital/Gloucestershire Oncology Centre**
RNI	**regional nodal irradiation**
RS	**Recurrence Score**
RT	**Radiotherapy**
RTOG	**Radiation Therapy Oncology Group**
Rt	**Right**
S	**Significant**
SCM	**Sternocleido mastoid**
SCV LN	**Supraclavicular lymph nodes**
SD	**Standard deviation**
SERM	**Selective Estrogen Receptor Modulator**
SLNB	**Sentinel Lymph Node Biopsy**
SM	**setup margin**
START Trial	**Standardisation of Breast Radiotherapy Trial**
T	**Primary Tumor**
T	**docetaxel**
TPS	**treatment planning system**
TV	**The Treatment volume**

UK	**United Kingdom**
U/S	**Ultrasound**
WBI	**whole breast irradiation**

Introduction

In 2016, it is estimated that among U.S. women there will be 246,660 new cases of invasive breast cancer, 61,000 new cases of in situ breast cancer and 40,450 breast cancer deaths ***(American Cancer Society 2016)***

In 2013 the estimated age-adjusted annual incidence of breast cancer in the European Union (25 countries) was 110.6/100, 000 and the mortality 24.0/100 000 ***(Ferlay et al., 2013).***

In Egypt, breast cancer is the most common cancer in females, it represents 37.6% of all cancer cases in Gharbia cancer registry and 31.5% of all cancer cases presented to the NCI between the year 2011 and 2014 ***(Ibrahim etal, 2014).***

Early stage breast cancer is defined as stage II or less on the basis of the lack of lymph node, metastasis & the clinical lesion size less than 5 cm. Most women who are newly diagnosed with early stage breast cancer have a choice of breast conserving Therapy (BCT). **(Suzuki et al, 2006).**

Breast conserving therapy (BCT) consists of resection of the primary breast tumor (lumpectomy, segmental mastectomy or wide local excision) followed by whole breast irradiation (WBI). **(Fisher et al, 2002).**

The main aim of external beam radiotherapy (EBRT) for early stage

breast cancer is to destroy any cancer cells that may remain in the breast and surrounding area after surgery, while chemotherapy is used for systemic control to prevent spread to other anatomical sites outside the breast. Historically, a radical mastectomy was carried out for patients who had small breast tumors. Breast conserving therapy (BCT), which consists of lumpectomy followed by breast irradiation, a total dose of 45- 50 Gy is delivered to the entire breast over 5 to 6 weeks (1.8 to 2 Gy per fraction). In most of the patients a boost dose of 10-16 Gy to the tumor bed is added produces the same survival results that of mastectomy. **(Bartelink et al., 2015).**

A meta-analysis by the Early Breast Cancer Trialist Group confirmed that both mastectomy and radiotherapy following lumpectomy reduce the 5-year local recurrence rate from 26 to 7% ***(Clarke et al., 2005).***

Poortmans et al. (2008), reported improved local control using 10 years randomized data from over 5000 patients, demonstrated the effects of the addition of a 16 Gy boost dose to the primary tumor site following BCT. Whole breast irradiation (WBI) generally consists of a simple two field tangential field arrangement followed by a direct electron field called the boost that is delivered to the primary tumor site.

In a meta-analysis of 17 randomized trials, external beam radiotherapy after breast conservation surgery was shown to reduce mortality by 3.3% in node negative patients and 8.5% in patients with node positive disease ***(Buchholz. 2011). Veronesi et al. (2002)***