



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

Thesis

Submitted for partial fulfillment of MD Degree in clinical Oncology and Nuclear Medicine

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2019

ACKNOWLEDGMENT

*First of all, thanks to **ALLAH**. The most merciful and the most beneficent for giving me the strength to complete this work and for giving me such a wonderful family.*

*I would like to express my deep gratitude to Prof. **Dr. Manal Moawad**, Professor and chairman of Clinical oncology and nuclear medicine, Ain Shams University, for her continuous guidance, meticulous supervision and tremendous enthusiasm. She did not spare any effort to read every word in this work.*

*A special gratitude is cordially paid to Prof. Dr. **Khaled Nageeb**, assistant Professor of Clinical oncology and nuclear medicine, Ain Shams University, for his sincere help and continuous support.*

*I wish to extend my deepest appreciation to **Prof. Dr. Nagy Gobran**, assistant Professor of Clinical oncology and nuclear medicine, Ain Shams University for his faithful help, support and encouragement during this work.*

*I would also like to offer my deepest and sincere gratitude to **Dr. Ahmed Gaballah** assistant Professor of Clinical oncology and nuclear medicine, Ain Shams University for his co-operation and valuable supervision throughout the course of the study.*

I would like to express my honest and hearty appreciations, endless thanks of gratitude to [Prof. Dr. Alphonse Taghian](#), professor of Radiation Oncology, MGH, Harvard University, who offered me generous support, sincere concern and valuable advices and guided me through the world of Radiation Oncology.

I shall never forget the great support of my mother [Prof. Dr. Inas AbdelHalim](#), professor of clinical oncology and nuclear medicine Department, Mansoura university and my family who stood beside me throughout this work giving me their support.

Words fail to express my love, respect and appreciation to my dear wife for her unlimited help and support.

Last but of course not least, I would like to express my deep feelings toward each one gave me a hand in this work.

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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-Fluorouracil, 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 et al, 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)**