

The Impact of Immediate Breast Reconstruction on the Technical Delivery of Postmastectomy Radiotherapy

Thesis

Submitted for Partial Fulfillment of M D degree
In Radiation Oncology and Nuclear Medicine

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2010

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Praise to Allah, the most gracious and the most merciful

ACKNOWLEDGEMENT

First of all, I would like to thank God

My dear parents and my wife, they have really eased the way and their support was invaluable

*My deep and endless thanks to **Professor Doctor Atef Youssef** who honoured me by his kind supervision for his time, and sincere help. Without his support and encouragement my studies would not have been possible.*

*I would like to express my gratitude to **Professor Doctor Tarek Hussein** who gave me much of his time, effort, experience and continuous guidance throughout the work.*

*I wish to thank **Doctor Hany AbdelAziz** for his valuable advice and close supervision during the progress of this work. His meticulous guidance and generous assistance were crucial in the completion of this study.*

*My deepest gratitude to **Doctor Amit Bahl**, Consultant clinical oncologist, Bristol University Hospitals, for his irreplaceable encouragement, his expertise and his great directions all through the work. He has really made the work more enjoyable.*

List of contents:

Introduction	1
Review of literature	6
I. Early breast cancer, the biology of the disease and implications for management	6
II. Mastectomy	12
III. Adjuvant Radiotherapy	16
Background	16
Mastectomy with radiotherapy	18
Adjuvant breast radiotherapy meta-analyses	23
Radiotherapy planning and techniques	29
Areas of controversy in postmastectomy radiotherapy	45
Side effects of postmastectomy radiotherapy	52
IV Breast Reconstruction	75
Safety of breast reconstruction	75
Indications and contraindications for breast reconstruction	80
Principles of breast reconstruction	80
Timing of reconstruction, immediate versus delayed	82
Reconstructive techniques	92
Non-autologous breast reconstruction	92
Autologous breast reconstruction	95
V. Breast reconstruction and Radiotherapy	101
Radiation therapy techniques	102
Technical problems related to irradiation of the reconstructed breast	107
Effect of prosthesis on radiation dose distribution within the breast	112
The effect of postmastectomy radiotherapy on breast reconstruction	115

Outcome with autologous breast reconstruction.....	122
Outcome with prosthetic implant.....	124
The American Society of Clinical Oncology (ASCO) guideline in integration of postmastectomy radiotherapy and reconstructive Surgery.....	132
Patients and Methods.....	134
Eligibility Criteria.....	134
Methods.....	135
Guide lines on radiotherapy.....	138
Assessment of acute and late radiation morbidity.....	140
Assessment of radiotherapy technique.....	144
Data management.....	147
Results	151
Demographics.....	151
I. Patients characteristics.....	153
II. Tumour characteristics.....	155
III. Assessing and scoring postmastectomy radiotherapy plans.....	163
IV. Treatment Morbidities.....	176
Discussion	181
Conclusions.....	198
Summary.....	200
References.....	202

List of figures:

Figure 1: NCI cancer mortality statistics in Egypt.....	7
Figure 2: Overall survival in the Danish Breast Cancer Collaborative Group trial (Radiotherapy + CMF versus CMF alone).....	20
Figure 3: Overall survival in the Danish Breast Cancer Collaborative Group trial (Radiotherapy + Tamoxifen versus Tamoxifen alone).....	21
Figure 4: Overall survival in the British Columbia Cancer Agency trial...	22
Figure 5: Diagram illustrating Gross Tumour Volume, Clinical Target Volume and Planning Target Volume.....	30
Figure 6a, b: Patient position on simulator couch and treatment wedge, gripping on to a treatment pole.....	33
Figure 7: Simulator X-ray images of breast tangents (7a) and supraclavicular + axillary fields (7b).....	35
Figure 8: CT image obtained from simulator machine with cone beam imaging facility.....	36
Figure 9: Radiation pneumonitis Chest X ray.....	59
Figure 10: CT demonstrating Radiation pneumonitis.....	60
Figure 11: Schema for delayed-immediate breast reconstruction.....	89
Figure 12: Outcomes after delayed-immediate breast reconstruction.....	90
Figure 13: Fixed volume silicone breast implant with an expandable implant for comparison.....	94
Figure 14: TRAM Flap Breast Reconstruction.....	97
Figure 15: Top: Immediate left breast reconstruction with Latissimus dorsi flap; and nipple-areola complex reconstructed. Bottom: Donor site scar.....	99
Figure 16: Radiotherapy plan Compromise: reduced chest wall coverage medially and/or laterally.....	107
Figure 17: Radiotherapy plan Compromise: increased lung within the treatment field.....	108
Figure 18: Age distribution in the studied group.....	153
Figure 19: Menstrual status in the studied group.....	154

Figure 20: Tumour grade in the studied group.....	155
Figure 21: Tumour stage in the studied group.....	156
Figure 22: Distribution of patients according to Lymph node status.....	157
Figure 23: Lymphovascular invasion among the studied group.....	158
Figure 24: Hormone receptor status in the studied group.....	159
Figure 25: Her 2 neu status in the studied group.....	160
Figure 26: Type of flap used for breast reconstruction in the studied group.....	161
Figure 27: Numbers of right versus left breast cancer cases in the studied group.....	162
Figures 28 a, b: Frequency of treatment planning scores by deductions.....	164
Figure 29a: An optimal treatment plan of the right breast received no point deductions in chest wall coverage, minimization of lung volume.....	165
Figure 29b: An optimal treatment plan of the left breast received no point deductions in chest wall coverage, minimization of lung volume and avoidance of heart.....	166
Figure 30: A treatment plan with moderate compromise received 2 point deductions.....	167
Figure 31: Percent of optimum plans in the 5 parameters assessed.....	169
Figure 32: Percent of optimum radiotherapy plans by treated side.....	169
Figure 33: Frequency of complete chest wall coverage.....	170
Figure 34: Medial versus lateral border shift in tangent fields.....	171
Figure 35: Dose homogeneity in planning target volume.....	172
Figure 36: Depth of lung involved in tangents.....	173
Figure 37: Thickness of heart included in tangent fields in left sided breast plans.....	174
Figure 38: D max in radiotherapy plans.....	175
Figure 39: Acute skin toxicity among the studied group.....	177
Figure 40: Late skin toxicity among the studied group.....	178
Figure 41: Pneumonitis among the studied group.....	179

List of Tables:

Table 1: Mean doses to structures using different radiotherapy techniques.....	40
Table 2: Studies reporting local recurrence rate after breast reconstruction for invasive breast cancer.....	79
Table 3: Assessment of postmastectomy radiotherapy plans with and without breast reconstruction.....	111
Table 4: Cosmesis and risk of complications in patients undergoing autologous reconstruction and radiotherapy.....	122
Table 5: Cosmesis and risk of complications in patients undergoing prosthetic reconstruction and radiotherapy.....	127
Table 6: ECOG performance status scale.....	136
Table 7: RTOG/EORTC grading criteria for acute radiation toxicity.....	142
Table 8: RTOG/EORTC late radiation morbidity grading criteria.....	143
Table 9: Radiotherapy plans scoring system guidelines.....	146
Table 10: Data collection form for radiotherapy acute & late morbidity..	148
Table 11: Data collection form for radiotherapy plan assessment....	149,150
Table 12: Patient and tumour characteristics.....	152
Table 13: Age distribution in the studied group.....	153
Table 14: Menstrual status in the studied group.....	154
Table 15: Tumour grade in the studied group.....	155
Table 16: Tumour stage in the studied group.....	156
Table 17: Lymph node status in the studied group.....	157
Table 18: Lymphovascular invasion among the studied group.....	158
Table 19: Hormone receptor status in the studied group.....	159
Table 20: Her 2 neu status in studied groups.....	160
Table 21: Type of autologous flap used in reconstruction.....	161
Table 22: Numbers and percentages of right versus left breast cancer cases in the studied group.....	162
Table 23: Frequency of treatment planning scores by deductions.....	164

Table 24: Frequency of optimum treatment plans in the studied parameters.....	168
Table 25: Percent of optimum radiotherapy plans by treated side.....	169
Table 26: Frequency of complete chest wall coverage.....	170
Table 27: Medial versus lateral border shift in tangent fields with less than 100% coverage of the chest wall.....	171
Table 28: Dose homogeneity in planning target volume.....	172
Table 29: Depth of lung involved in tangents.....	173
Table 30: Thickness of heart included in tangent fields in left sided breast plans.....	174
Table 31: D max in radiotherapy plans of the studied group.....	175
Table 32: Acute skin toxicity among studied group.....	177
Table 33: Late skin toxicity according to among studied group.....	178

List of Abbreviations

ASCO.....	American Society of Clinical Oncology
AJCC.....	American Joint Committee on Cancer
ATM.....	Ataxia Telangectasia Mutated gene
CTV.....	Clinical Target Volume
DIEP.....	Deep Inferior Epigastric Perforator
EBCTCG.....	Early Breast Cancer Trialists Collaborative Group
GTV.....	Gross Tumour Volume
IBR.....	Immediate Breast Reconstruction
IMC.....	Internal Mammary Chain
IMRT.....	Intensity Modulated Radiotherapy
JCRT.....	Journal of Cancer Research and Therapeutics
LD.....	Latissimus Dorsi
LR.....	Local Recurrence
LRF.....	Locoregional Failure
MRC.....	Medical Research Council
MRI.....	Magnetic Resonance Imaging
NCI.....	National Cancer Institute
NSSM.....	Non Skin Sparing Mastectomy
NTCP.....	Normal Tissue Complication Probability
PMRT.....	Postmastectomy Radiotherapy
PTV.....	Planning Target Volume
RT.....	Radiotherapy
SSM.....	Skin Sparing Mastectomy
TRAM.....	Transverse Rectus Abdominis Myocutaneous

INTRODUCTION

Radiation therapy is an integral part of the multimodality treatment of breast cancer. While it has enjoyed a well-established role after breast-conserving surgery, for over 40 years radiation therapy also has been used after mastectomy to the chest wall with or without the regional nodes to reduce local-regional recurrence, but with various degrees of success in improving survival [*Early Breast Cancer Trialists' Collaborative Group, 2000*].

In recent years, there has been increasing evidence from prospective randomized trials and large meta-analyses supporting greater utilization of radiation therapy for patients at high risk for local-regional relapse after mastectomy [*Ragaz et al., 2005*]. Current controversy is now more focused on defining the role of radiation for intermediate risk patient subgroups, issues of sequencing with other therapies, and the importance of regional lymph node treatment. Today, there is broad consensus on indications for postmastectomy radiation that make approximately one-third of patients eligible for treatment after mastectomy [*National Comprehensive Cancer Network, 2005*].

With an increase in indications for postmastectomy radiation, there will be an increased need to consider the special implications of combining radiation with breast reconstruction. More women today have the option for breast reconstruction because of advances in surgical techniques.

Implants now come in a variety of forms including expander prostheses, with or without detachable valves for one- and twostage procedures. The move to less radical mastectomy that spares the pectoralis fascia, and acceptance of skin-sparing mastectomy, has increased the number of women eligible for implant reconstruction. Older fears of a negative impact on recurrence risk or cancer detection after breast reconstruction have been disproved. And patients diagnosed at a younger age caused by the increased prevalence of mammogram screening may be healthier and more inclined to be eligible for and motivated for breast reconstruction. While there has been considerable progress in the past decade in developing pedicle and free tissue transfer to provide options for women not candidates for or not desiring implants [*Freedman, 2005*].

Once a decision has been made between a patient and the plastic surgeon for breast reconstruction, the next decision to be made is regarding the option for either immediate or delayed reconstruction. [*Kronowitz and Robb, 2004*]

Immediate reconstruction in general is associated with many advantages to the patient compared with delayed reconstruction. Immediate timing during the mastectomy will provide the patient with an important cosmetic and psychological benefit, not awaking from mastectomy with a complete absence of a breast. Delaying reconstruction until after completion of all adjuvant chemotherapy and radiation may translate into a patient waiting 6–9 months for the procedure.

Immediate reconstruction is also associated with avoidance of a second operation with its associated risks including anesthesia infection and other perioperative complications. The inconvenience and cost of a second hospitalization is also avoided. For these reasons, immediate timing of reconstruction with mastectomy remains an option and may be preferable for most patients choosing or requiring reconstruction. [*Freedman, 2005*]

Although immediate breast reconstruction is ideal for many patients, there are two significant disadvantages with this approach in patients with locally advanced breast cancer. First, radiation can affect the aesthetic outcome of the reconstructed breast. [*Buchholz et al, 2002*] A study of immediate transvers rectus abdominus flap reconstructions showed the commonest complications were fat necrosis (16%) and radiation fibrosis (11%), although this population underwent autologous immediate breast reconstruction. [*Hunt et al, 1997*] Fat necrosis leads to volume loss and hardening of the reconstructed breast and particularly occurs when radiotherapy is given after immediate breast reconstruction using free tissue transfer of skin and fat only (e.g. deep inferior epi-gastric perforator; DIEP flap). [*Mehta et al, 2004*]

The second major issue with immediate reconstruction concerns the design of radiation fields. The randomized trials showing a survival advantage with postmastectomy radiation included the chest wall, internal mammary lymph nodes, axillary apex, and supraclavicular lymph nodes within the

radiation fields. To include these targets and minimize dose to the heart and lung, a medial chest wall electron beam field is typically matched to more laterally placed opposed tangent fields. This arrangement is not feasible after reconstruction because the sloping breast contour leads to an imprecise geometric matching of the fields. Alternative field arrangements require either exclusion of the internal mammary lymph nodes as a target volume or acceptance of an increase in the volume of normal tissue irradiated, with a possible increase in the risk of complications. Thus, it is strongly advocate that all patients with locally advanced breast cancer receive comprehensive information about these implications and be treated by a closely coordinated multidisciplinary team whose focus is on avoidance of recurrence, improvement of curability, and maximization of long-term quality of life [*Buccholz et al, 2002*]

Radiotherapy and breast reconstruction are not incompatible, but careful consideration of their relative timing and technique is important.[*Fodor, 2003*] How to optimally sequence postmastectomy radiation and breast reconstruction is a subject of ongoing research and innovative approaches are still needed to further facilitate patients quality of life without compromising their treatments [*Buccholz et al., 2002*]. Plastic surgeons should counsel patients before starting their cancer disease treatment, and those who choose to have reconstruction need to be informed about risks for specific complications associated with the procedure. [*Fodor, 2003*]

Aim of the Work

To quantify the impact of immediate breast reconstruction on radiation therapy planning among breast cancer patients who underwent modified radical mastectomy, to study the actuarial incidence of acute and late complications of irradiation.