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

**Thesis**

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***Praise to Allah, the most gracious and the most merciful***

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# 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.