

# Breast Cancer in the New Age – IMRT

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## Abstract

Since its introduction into clinical use, IMRT (Intensity Modulated Radiation Therapy) has revolutionized the ability to deliver radiation to the breast. The ability to optimally manipulate the intensities of individual rays within each beam allows for potential improved tumor control with normal tissue toxicity reduction.<sup>1</sup>

## Introduction

Breast cancer statistics show 213,000 new cases per year with 40,000 deaths. It is the leading cancer among women and is the second leading cause of cancer death in women. Breast cancer risk factors include the following: gender – male: female 1:100; age – 1 in 50 women by the age of 50 and 1 in 8 over a lifetime. The environment and physical risks include: early menarche, late menopause, nulliparity, late first pregnancy, high-fat diet, alcohol- and tobacco-use, and decreased physical activity. Related risks are exogenous hormones with replacement therapy being particularly problematic. The inherited factors are: family history, major inherited susceptibility, and DNA repair defects. Cases can be sporadic (70%), family clusters (20%), or hereditary (10%). The cause of hereditary susceptibility is BRCA1 – 20 to 40%; BRCA2 – 10 to 30%; TP53 <1%; PTEN <1%; and undiscovered genes 30 to 70%. The most common are the BRCA mutations, which occur in multiple cases of early-onset cancer. A family history of ovarian cancer shows an increased incidence in breast cancer. The patients who have bilateral breast cancer are most likely to Ashkenazi Jewish heritage and/or are male. The types of BRCA are

usually found in tumor suppressor gene on chromosome 17 and have autosomal dominant transmission.

## Diagnosis of Breast Cancer

Recommendations for women ages 20-30: monthly breast self-examination and clinical breast examination every three years. The baseline mammogram for high-risk patients (as defined above) starts at 35 years old. Low-risk patients should have monthly self- and yearly clinical breast examinations and occasional mammograms starting at age 40, though these recommendations are being reviewed intensely as the radiation risks are balanced and new technologies become available. The high-risk patient or one who has dense breasts should have a consultation with a high-risk specialist, possibly using ultrasound and/or MRI of the breast. The treatment is based on genetic, axillary lymph node status usually by sentinal node dissection, tumor size, histological grade, stage, hormonal receptors status, HER@/neu status, age, and margin status. The criteria were established by the NIH Consensus Conference 2003.

Staging consists of history and physical, chest, abdomen, and pelvis CT scan, MRI of the breasts, CBC, and blood chemistry. The standard treatment for early breast cancer is surgery with lumpectomy or partial mastectomy followed by chemotherapy and/or hormonal therapy. The chemotherapy and/or hormone therapy are dependent on the tumor size, DNA studies, and lymph node status. We follow with radiation to the breast. In advanced cancers we may use a modified radical mastectomy instead of the lumpectomy or partial mastectomy. New hori-

zons have brought new treatments with partial breast radiation and genetic and protein inhibitors.

## Radiation Discussion

IMRT has improved on delivery with sparing of healthy tissues and places more radiation in the tumor bed region. We have developed components to improve tumor control by using a prescription method, structure definition, setup aids and immobilization devices, positioning strategy, new delivery techniques, and quality assurance checks. The recommendation for the dose is to be delivered over the course of treatment with each session. We use several modes of operation to achieve the best course of treatment with radiography, cone beam CT, and fluoroscopy.

Many randomized trials are showing the benefit of IMRT and the reduction of long-term side effects, such as coronary artery disease. We continue to work through the clinical challenges ahead to eliminate this disease.

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