

Intensity modulated radiation therapy for the treatment of Stage 0, I and II breast cancer has been in clinical use at William Beaumont Hospital since March 1999. The goals of IMRT for breast cancer delivered through static, multileaf collimator segments include optimizing dose homogeneity, avoiding unnecessary normal tissue irradiation and standardizing target volume coverage without significantly increasing the time required to plan and treat patients. The IMRT process can be divided into four different phases, simulation, treatment planning, treatment delivery and quality assurance. During the initial simulation procedure an immobilization device is constructed, level marks are tattooed and the treatment borders are defined. A CT is done in the treatment position in order to define the treatment area as well as delineate normal tissues. In addition to the CT scan the use of MR is becoming a useful tool to define nodal regions of interest. The treatment plan is generated to deliver a homogeneous dose throughout the breast volume and minimize dose to the lungs and in the case of left sided breast patients the heart. The beam arrangement of two tangential fields is adjusted for depth, gantry angle and collimator angle in order to provide full coverage to the breast and lumpectomy cavity with sufficient margin and avoid unnecessary irradiation of normal tissue. The IMRT segments are created based on 5% increments of isodose surfaces; these forward planned segments are then optimized in order to deliver a homogeneous dose throughout the breast volume. The plan is evaluated with respect to percent of breast volume receiving doses in excess of 105% and 110% of the prescribed dose. The treatment process includes patient positioning and setup, electronic portal imaging and treatment delivery. This is accomplished in a conventional treatment time slot of 12 minutes. As part of the overall patient quality assurance patients are imaged everyday for every port during their treatment. On weekly review the physicians have ten images, five medial and five lateral, with which to make clinical treatment decisions as to patient setup and treatment port placement. In addition to patient quality assurance plan quality assurance is assessed by completion of an independent calculation check as well as analysis of treatment delivered to the MapCheck device as compared to the planned treatment. Both the fluence and absolute dose measurements can be analyzed with this system. Using intensity modulated radiation therapy to deliver whole breast irradiation has proven to be an efficient method to deliver uniform dose throughout the entire breast volume which can be seen to reduce the acute and chronic toxicity's associated with radiation therapy for the treatment of breast cancer. Research supported by Philips Medical Systems and Elekta Corporation.

Educational Objectives:

1. To understand the goals and use of IMRT in the treatment of breast cancer.
2. To understand the IMRT process for simulation, planning, treatment and quality assurance in the treatment of breast cancer.