

# Proton Treatment of Peripheral Lymph Nodes in Breast Cancer

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## Purpose/Objective(s)

The treatment of peripheral lymph nodes in locally advanced breast cancer patients often entails increased dose to organs at risk (OARs). The goal of this study is to evaluate the potential advantages of using proton therapy in treating peripheral lymph nodes vs. 3-dimensional conformal radiotherapy (3D-CRT) for left sided breast cancer patients.

## Materials/Methods

Treatment plan comparison was performed on planning computed tomography of 7 consecutive left-sided breast cancer patients. Patients were immobilized in the supine position using a Vac Loc device and Wing Board. All photon plans used a 4-field, mono-isocenter technique. Wide tangents were used to cover the internal mammary nodes. In the matched proton-photon technique, a proton field covering the internal mammary nodes, supraclavicular nodes and level II and III axillary nodes was matched to the opposing tangent photon fields. The proton field was planned using forward-planned, double-scattered 3-dimensional proton therapy techniques.

## Results

The breast and/or chest wall were adequately treated in both modalities. There was no significant difference in the coverage of supraclavicular nodes, level I or III axillary nodes. Protons improved the coverage of level II lymph nodes, with a mean D95 of 50 Gy compared to D95 of 37 Gy with 3D-CRT ( $p = 0.01$ ). Protons also improved the mean D95 of internal mammary nodes to 51 Gy vs. 42 Gy with 3D-CRT ( $p = 0.01$ ). When protons were used to cover the peripheral lymph nodes, there was a significant decrease in the dose to the heart and ipsilateral lung for all isodose levels. In comparing protons vs. 3D-CRT, the mean left lung dose was 2 Gy vs. 13 Gy ( $p = 0.01$ ); left lung V20 was 24% vs. 38% ( $p = 0.01$ ), left lung V5 was 42% vs. 84% ( $p = 0.01$ ), respectively. The mean heart V20 was 0% using proton vs. 8% with 3D-CRT ( $p = 0.01$ ). The use of protons also lowered the cardiac V5 from 44% to 2% ( $p = 0.01$ ). There was no significant difference in the mean maximum skin dose, which were 53 Gy in 3D-CRT and 56 Gy with the use of a matched proton field.

# Conclusions

Proton treatment of peripheral lymph nodes improved dose coverage of the peripheral lymph nodes and decreased the dose to the heart and ipsilateral lung. The dosimetric advantages may improve local control of breast cancer and reduce late effects from radiation treatment.