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Four Years Experience with Intraoperative Electron Radiation Therapy for Early Stage Breast

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Categories: Medical Physics, Quality Improvement, Radiation Oncology
Keywords: intraoperative, linear accelerator, breast cancer, mobile unit, electron

How to cite this abstract
Goetsch S, Shimizu K (March 21, 2019) Four Years Experience with Intraoperative Electron Radiation Therapy for Early Stage Breast. Cureus 11(3): a412

Abstract

Objectives: This paper reports the first four years of a clinical program using a mobile electron linear accelerator to treat patients at time of surgery for early stage breast cancer. The program began with 10 Gy boost and has now progressed to 21Gy monotherapy Methods: An electron linear accelerator (Mobetron 2000, Intraop Corporation) was acquired in March 2014. The unit moves on rubber tires into the operating room at time of surgery. It is self shielded with electrons of 6, 9 and 12MeV at dose rates of roughly 1100 MU/minute. The unit began treating selected patients in December, 2014. A total of 62 patients were treated with a 10 Gray "upfront boost" dose and expanded to treat patients with a monotherapy dose of 21Gy in November 2016. A total of 56 patients have now been treated with the higher dose. A copper shield (later replaced with a newly fabricated steel shield) is inserted distal to the treatment volume to act as internal shielding for X-rays generated by electrons stopping in the target. Results: Only early stage breast cancer patients (Stage I, no positive lymph nodes, imaged tumor size = 2.5cm) were admitted. Some patients with DCIS have also been treated. A total of 114 patients have now been treated, 4 of them with bilateral disease. Electron cone beam sizes of 4.5 to 7.0cm diameter have been used (median size 5.5cm). Bolus of 0.0 to 1.0cm was inserted in the electron beam path (median thickness 0.5cm). The 9MeV energy was used 69% of the time. Conclusions: Early stage breast cancer is highly curable with long term disease free survival rates exceeding 96%. The breast IOERT program offers a reduction or total elimination of outpatient radiation therapy treatment following surgery. Early results are encouraging, with no reported recurrences and good cosmetic results.

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Published 03/21/2019

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