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# Radiobiological comparison of 3D conformal and intensity modulated radiation therapy in the treatment of left-sided breast cancer

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► ***Original article***

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## ABSTRACT

***Background:*** The current study aimed to compare the tumor control probability (TCP) and normal tissue complication probability (NTCP) of three-dimensional conformal radiation therapy (3D-CRT) and intensity-modulated radiation therapy (IMRT) for left-sided breast cancer using radiobiological models. ***Methods:*** This study was conducted on 30 patients with left-sided breast cancer, who were planned for 3D-CRT and 6-9 fields IMRT treatments using the PROWESS treatment planning system. The planning target volume (PTV) dose of 50 Gy was administered for the 3D-CRT and IMRT plans, respectively. The Niemierko's equivalent uniform dose (EUD) model was utilized for the estimation of tumor control probability (TCP) and normal tissue complication probability (NTCP). ***Results:*** According to the results, the mean TCP values for 3D-CRT, 6-fields IMRT, and 9-fields IMRT plans were 99.07 ±0.07, 99.24 ±0.05 and 99.28 ±0.04, respectively, showing no statistically significant difference. The NTCPs of the lung and heart were considerably lower in the IMRT plans, compared to those in the 3D-CRT plans. ***Conclusions:*** From the radiobiological point of view, our results indicated that 3D-CRT produces a lower NTCP for ipsilateral lung. In contrast, for TCP calculations, there was a higher gain with IMRT plans compared to 3D-CRT plans.

***Keywords:*** *Radiobiological evaluation, left-sided breast cancer, three dimensional conformal and intensity-modulated radiation therapy.*

## INTRODUCTION

The most adopted radiation therapy treatment in breast cancer patients consists of Intensity Modulation Radiation Therapy (IMRT) and 3D conformal radiation therapy (3D-CRT), which have improved outcomes of treatment [1]. Despite the advanced treatment techniques applied in breast cancer radiotherapy, radiation-induced complications of the heart and toxicities of the respiratory system are relatively common. Radiation pneumonitis and pericarditis are recognized to be two potentially serious side effects of breast cancer radiotherapy, the risk of which may be reduced by the choice of appropriate radiotherapy technique [2, 3]. To deal with these issues, both dosimetric and radiobiological factors may enable us to distinguish between the different plans in radiotherapy. Hence, it is required to consider both radiobiological evaluation tools and dose distribution data to estimate biological modeling and evaluate the efficiency of different RT techniques. Tumor control probability (TCP) and normal tissue complications probability (NTCP) are two useful factors that determine the radiobiological efficiency of RT methods [4, 5]. The goal of radiotherapy in breast cancer is to