

Dosimetric Evaluation of 3 and 4 Field Radiation Therapy of Breast Cancer

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INTRODUCTION

Breast cancer is the most commonly diagnosed cancer among women and accounts for approximately 25% of all new cancer cases and 13% of all cancer deaths in Canadian women [1, 2]. In 2020, it is estimated that about 27,400 Canadian women will be diagnosed with breast cancer (an average of 75 new cases per day) and an estimated 5,100 women will die from the disease (an average of 14 deaths per day) [1, 2]. for high risk patients with node positive disease or are at greater risk of nodal metastasis, radiation therapy will involve treatment of the intact breast or chest-wall as well as the regional lymph nodes. This is achieved by using two tangential fields to treat the intact breast or chest-wall and an anterior and sometimes opposed posterior fields to treat the regional lymph nodes in the upper axillary and supraclavicular regions [3]

AIM

The objective of this study is to conduct a comprehensive retrospective dosimetric analysis of 3 and 4 field radiation therapy plans for high risk breast cancer patients treated at our cancer s in order to develop an institutional criterion for accepting volume-based 3 or 4 field breast radiation therapy treatment plans based on our current experiences and resources.

METHOD

We retrospectively evaluated the treatment plans of 354 high risk breast cancer patients with nodal involvement who were treated at our cancer center over a 4 year period. All patients were treated with a prescription dose of 50Gy in 25 fractions and based on patient suitability and tolerance, were either treated using the DIBH technique or the free-breathing technique.

CONCLUSIONS

The use of 3 or 4 field hybrid IMRT for radiation therapy of high risk node positive breast cancer patients provides an efficient and reliable method for achieving superior dose uniformity, conformity and homogeneity throughout the whole breast or post mastectomy chest-wall volume and the nodal regions with minimal doses to the organs at risk

References

1. Brenner DR, Weir HK, Demers AA, et al. for the Canadian Cancer Statistics Advisory Committee. Projected estimates of cancer in Canada in 2020. CMAJ. 2020; 192(9):E199-205. doi: 10.1503/cmaj.191292
2. Canadian Cancer Society. Breast Cancer Statistics. 2020. <https://www.cancer.ca/en/cancer-information/cancer-type/breast/statistics/?region=on> Accessed on April 17 2020
3. Kagkiousis J, Platoni K, Kantzou I, et al. Review of the three-field techniques in breast cancer radiotherapy. Journal of BUON.: official journal of the Balkan Union of Oncology. 2017; 22(3):599-605.

RESULTS

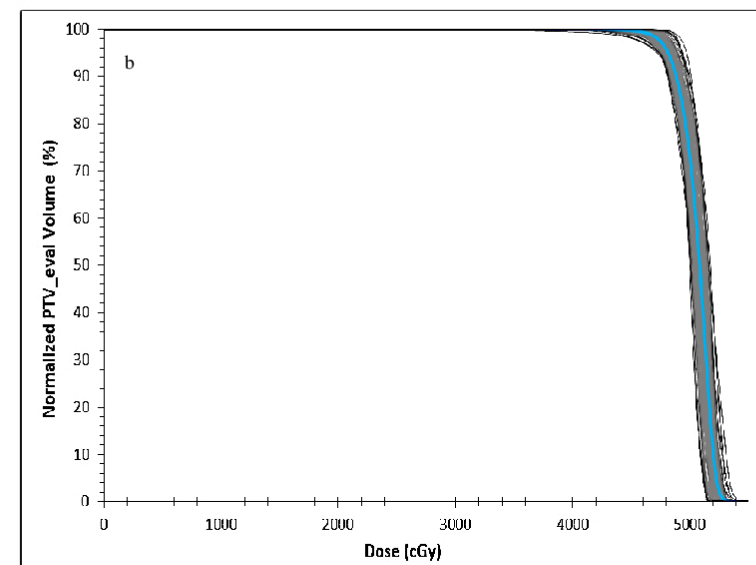
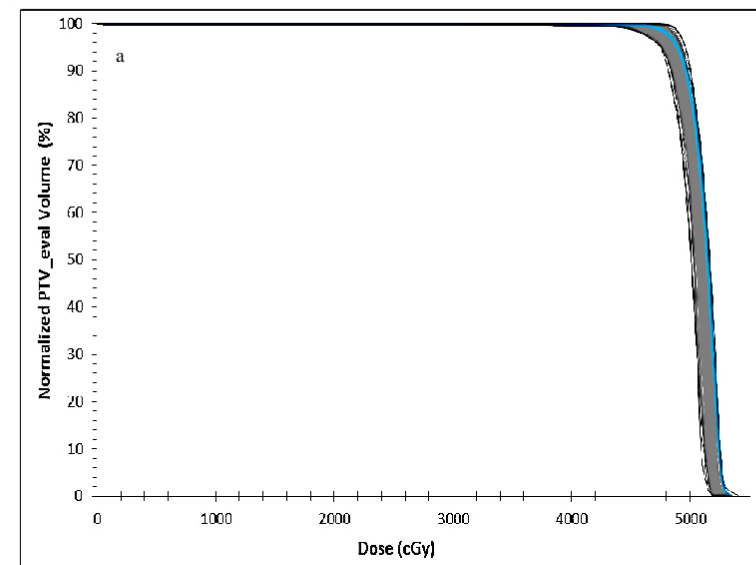


Figure 1 A plot of the dose-volume histogram (DVH) of the PTV_eval for all intact breast (a) and chest-wall (b) patients treated using the deep inspiration breathe hold technique or free breathing technique.

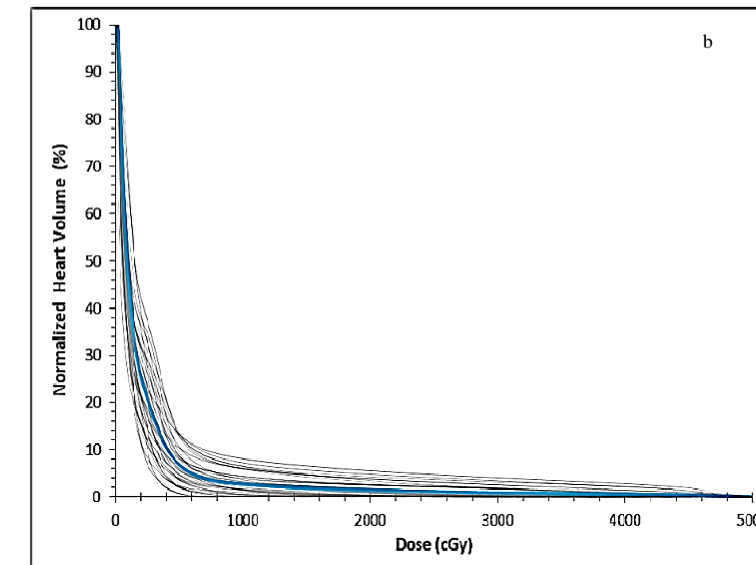
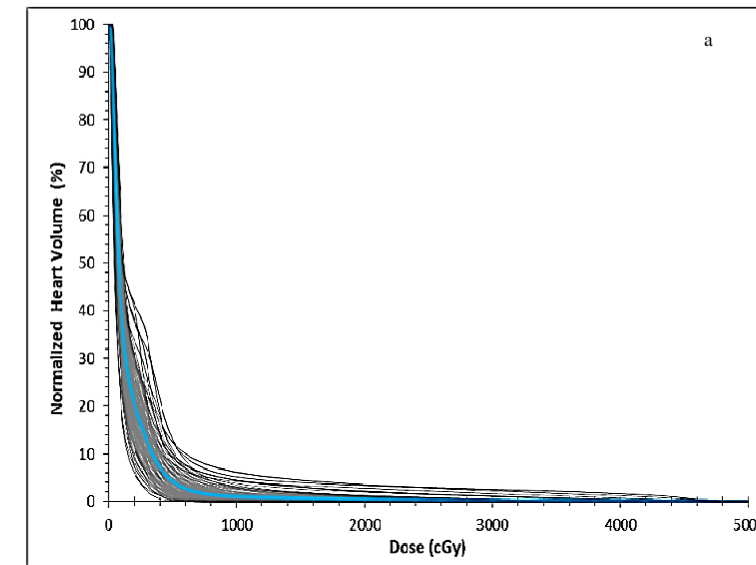


Figure 2 A plot of the dose-volume histogram (DVH) of the heart for all patients (intact breast and chest-wall) patients treated using the deep inspiration breathe hold technique (a) and free breathing technique (b).

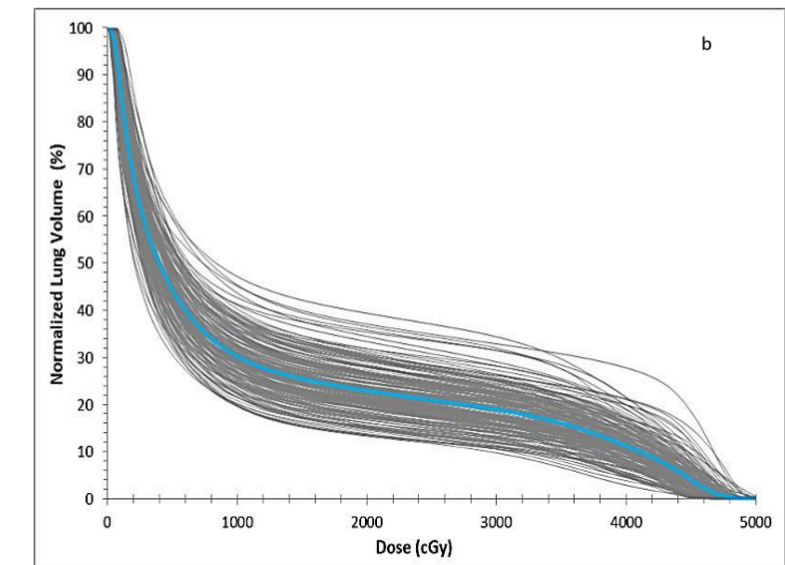
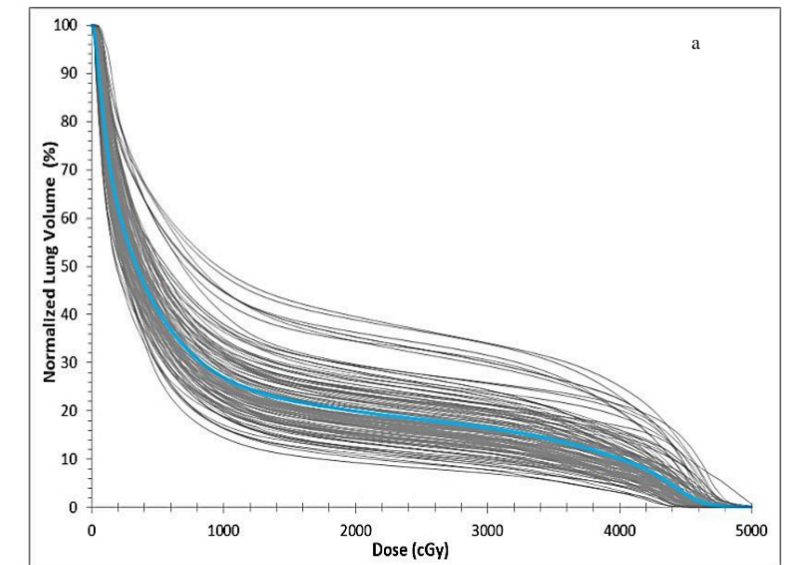


Figure 3 A plot of the dose-volume histogram (DVH) of the ipsilateral lung for all patients (intact breast and chest-wall) patients treated using the deep inspiration breathe hold technique (a) and free breathing technique (b).

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