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Margin Dose Distribution Based on A Breast Radiotherapy: A Case Report

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Abstract

Background: *In radiotherapy, a known volume of disease should be covered by reachable dose distribution. Margin is usually added to cover different variations due to the clinical environment of the disease target. It is normal the inner target will attain more dose coverage than that of the outer margin. However, in some situation, the outer margin may have high coverage than that of inner volume. In this report, a special dose distribution situation was reported based on a tangent field left breast treatment setup, and this could be a variation in the intension of a target definition.*

Methods: *Following routine chart check procedure, a left breast radiotherapy case with special dose distribution was selected. The target definition is like the of Accelerated Partial Breast Irradiation approach to lower the possibility of ribs complication. And the gross target volume (GIV), clinical target volume (CTV), and prescription isodose volume (PIV) at the rib boundary were cutoff into one surface at abutment of the rib line. Then regular tangent fields were setup with photon energy at 10MV, and field In field technique was employed to teach the maximum dose requirement of 105% of the prescription dose of 520cGy per fraction and delivered 5 fractions to attain the clinical goal of 101% prescription dose volume covered 95% of the PTV. The volume coverage of the GTV, CTV, and PTV was analyzed.*

Results: *For the geometry setup of this plan with GTV at 7.75cc, with diameter of 2.5cm, and CTV at 50.11cc with diameter at 4.5cm, and PTV at 86.42cc with diameter at 5.5cm. The PTV coverage at prescription dose was 99.7%, and CTV coverage was at 99.5%, and GTV was at 98.5%, which meant that the GTV coverage was lower than CTV and PTV.*

Conclusion: *The analysis showed a special dose distribution of breast treatment where target was abutted to that of the chest wall ribs. The target definition and dose distribution were different with that of conventional understanding.*

Keywords: Breast Radiotherapy, Accelerated Partial Breast Irradiation (APBI), Chest wall, Dose Volume Histogram.

Introduction

In radiotherapy, a known volume of disease should be covered by reachable dose distribution. In modern practice, Panning Target Volume (PTV) is from margined Clinical Target Volume (CTV,) which is attained by adding margin to Gross Tumor Volume (GTV) [1, 2] as outlined in the ICRU guidelines. The margin is used to cover different variation due to the clinical environment of the disease target. It is normal the inner target will get more dose to outer margin. however, due to some special clinical constraint requirements, for example, accelerated partial breast irradiation (APBI) [3, 4]as using methods previously reported by Li and Newton according to NSABP trial specifications,4 some special dose distribution could be generated. In this situations, special attention may be needed to clinical goal accomplishment and precision dose fabricated and delivered. In this report, a special dose distribution situation was reported based on a tangent field left breast treatment setup, and this could be a discrepancy in the intension of a target definition.

Case Presentation

From routine chart check procedure, the specialty of this left breast radiotherapy case was discovered. The target definition is like the of Accelerated partial breast irradiation approach in order the avoid the chest wall rib complication possibility. Figure 1 shows the targets.

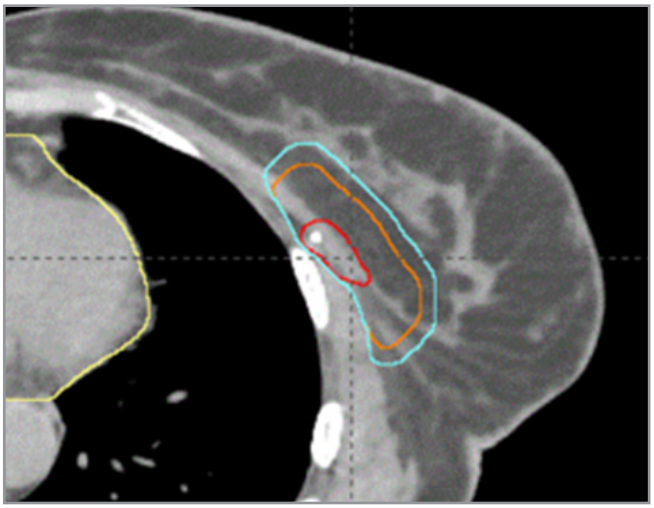

Figure 1: GTV in red, CTV in orange, and PTV in blue.

In the figure, the GTV, CTV, and PTV at the rib boundary were the cutoff and in one surface at certain region. Then regular tangent fields were setup as medium tangent field at gantry angle 319 degree, and collimator at 5 degrees with Jaw aperture at 24cm x12.5cm, and the lateral tangent field was at gantry angle 139 degree, and 355 degree of collimator angle, ant field size of 23.5cmx12.5cm. the monitor unit (MU)s for these two fields were 334 and 273. The energy of x-ray beam was at 10MV. And field in field technique was employed to reach the maximum dose requirement of 105% of the prescription dose of 520cGy per fraction and delivered 5 fractions to attain the clinical goal of 101% prescription dose volume covered 95% of PTV. The volume coverage of the GTV, CTV, and PTV was analyzed based on the Dose volume histogram(DVH) or prone setup treatment.

Results

For the geometry setup of this plan with GTV at 7.75cc, with diameter of 2.5cm, and CTV at 50.11cc with diameter at 4.6cm, and PTV at 86.42cc with diameter at 5.5cm. The PTV coverage at prescription dose was 99.7%, and CTV coverage was at 99.5%, and GTV was at 98.49%, which meant that the GTV coverage was lower than those of CTV and PTV. Figure 2 showed the Dose volume histogram of these results.

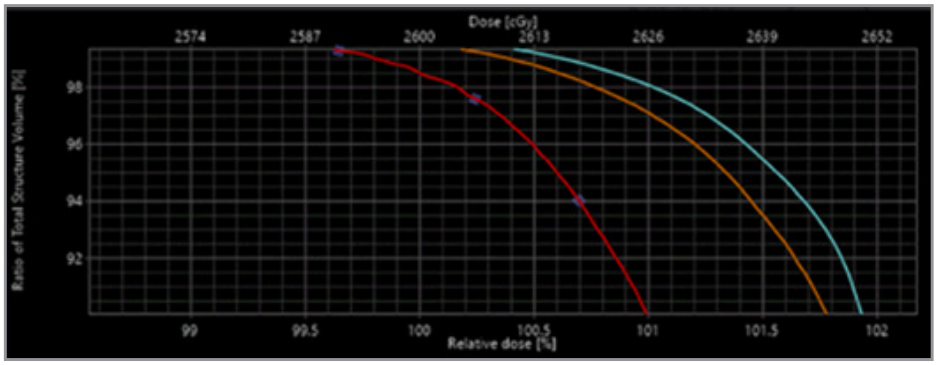

Figure 2: DVH curves with GTV in red, CTV in orange, and PTV in blue.

Discussion

The discover showed a special dose distribution of breast treatment where target was abutted to that of the chest wall ribs. The target definition and dose distribution were different with that of conventional understanding, the technical control of this dose distribution to these margin target could be further investigated, and the clinical advantage and outcome benefit may intrigue special clinical study in future. Especially for a breast treatment center, meticulous attention should be required to reach high precision radiotherapy with different technique such as Deep Inspiration Breath Hold (DIBH) or prone setup treatment [5].

Conclusion

We reported a special dose distribution in a left breast treatment with the dose distribution varied from target margin intension, which suggest the treatment planning setting should be addressed.

Acknowledgments

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