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abstract

Shoulder-sparing Inverse Planning IMRT versus Forward Planning IMRT for Post-mastectomy Chest Wall and Regional Nodal Irradiation: A Dosimetric Comparison Study

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Shoulder-sparing Inverse Planning IMRT versus Forward Planning IMRT for Post-mastectomy Chest Wall and Regional Nodal Irradiation: A Dosimetric Comparison Study

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Introduction: Post-mastectomy radiotherapy (PMRT) using moderate hypofractionation has become the standard of care for chest wall and regional nodal irradiation. However, shoulder pain and stiffness affect up to one-third of survivors, especially those with axillary dissection. These late effects can impair the activity of daily living and overall quality of life. Prior dosimetric studies, including our own earlier work, have largely overlooked the dose to the adjacent shoulder musculature (Shoulder-OAR). Recognising this gap, the present study evaluates the potential of Tangent Inverse Planning IMRT (T-IMRT) to better spare the Shoulder-OAR compared with conventional forward-planned Field-in-Field 3DCRT (FIF 3DCRT).

Methodology: Ten left-sided PMRT patients treated with moderate hypofractionation (40 Gy in 15 fractions, DIBH) were replanned using both techniques. Target volumes and conventional organs at risk were contoured using standard guidelines, and additional shoulder and back OARs were delineated based on recent guidelines. Dosimetric parameters were compared using the Mann–Whitney test.

Results: T-IMRT achieved target coverage with lower doses to the shoulder and back:

- Shoulder V30Gy: 28.8 ± 10.1 (FIF) vs 4.6 ± 4.5 (T-IMRT): p<0.001,
- Shoulder V20Gy: 37.0 ± 8.7 vs 15.3 ± 5.8: p<0.001,
- Back-OAR- V30Gy: 19.10 ± 8.99 vs. 3.08 ± 2.45: p<0.00024,
- Back-OAR- V20 was 24.91±10 vs. 14.38 ± 8.13: p<0.0152).

The low dose to the left lung (V8Gy): 35.85±7.96 and 54.3±11.64; p<0.002) in FIF 3DCRT and T-IMRT, respectively. Cardiac and lung doses remained comparable, though low-dose lung exposure slightly increased due to IMN inclusion.

Conclusion: IMRT can significantly reduce radiation exposure to the shoulder muscles, which may help preserve long-term arm mobility and improve quality of life. Most dosimetric studies, in-

cluding our previous work, have largely overlooked this area. There is an urgent need for a collaborative, multi-institutional effort to validate the use of shoulder and back organ-at-risk (OAR) sparing in treatment planning and to correlate these dosimetric benefits with functional outcomes.

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