ONCODAILY MEDICAL JOURNAL

abstract

A Comparative Study of Treatment Planning to Determine the Feasibility of Hybrid IMRT for Left-Sided Chest Wall Irradiation

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DOI: 10.69690/ODMJ-018-3101-6693

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Asia and Middle East Society of Therapeutic Radiation and Oncology
Affiliated with ASTF

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A Comparative Study of Treatment Planning to Determine the Feasibility of Hybrid IMRT for Left-Sided Chest Wall Irradiation

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Introduction: Radiotherapy is a key component of post-mastectomy breast cancer management. For left-sided cases, the close proximity of the heart and lungs increases the risk of radiation-induced toxicity. Conventional techniques such as 3DCRT and IMRT are commonly used but have limitations related to dose conformity, homogeneity, or resource utilization. Hybrid IMRT, which integrates 3DCRT and IMRT fields, may offer an optimal balance between target coverage and organ-at-risk (OAR) protection. This study aims to evaluate the feasibility and dosimetric performance of Hybrid IMRT in left-sided chest wall irradiation.

Methodology: Treatment plans from ten post-mastectomy left-sided breast cancer patients were retrospectively reviewed. Three planning techniques, FiF (Field-in-Field), IMRT, and Hybrid IMRT, were generated using a prescription dose of 40.05 GY in 15 fractions. Dose-volume histogram (DVH) parameters were analyzed for PTV coverage, conformity, homogeneity, and OAR sparing. Clinical feasibility was assessed using monitor units (MU),beam-on time (BOT), and planning complexity.

Results: All three techniques met the required PTV coverage criteria. IMRT demonstrated the highest conformity, followed by Hybrid IMRT, with FiF showing comparatively lower conformity. IMRT also produced the most homogeneous dose distribution, while FiF and Hybrid IMRT maintained acceptable, though slightly lower, homogeneity. For OARs, IMRT resulted in a higher mean heart dose, whereas Hybrid IMRT provided superior lung sparing, showing reduced lung dose exposure compared to FiF and IMRT.

Conclusion: Hybrid IMRT achieved a favorable balance between target coverage and OAR protection, offering improved conformity and acceptable homogeneity relative to FiF and IMRT. Additionally, its lower MU, shorter BOT, and reduced low-dose spillage highlight its efficiency and clinical practicality. These findings support Hybrid IMRT as a feasible and resource-efficient technique for left-sided chest wall irradiation.

Conflict of interests: The authors declare no conflict of interests.

Funding: This research received no specific grant from

any funding agency in the public, commercial, or not-for-profit sectors.