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Inter-Observer Variations of the Tumor Bed Delineation for Patients after Breast-Conserving Surgery in Preoperative Magnetic Resonance and Computed Tomography Scan Fusion

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Purpose/Objective(s): Identification and contouring tumor bed volume as accurately as possible to reduce recurrence and improve cosmetic effect. We compared tumor bed delineation based on preoperative magnetic resonance(pre-MRI) fused with CT imaging to CT only to define pre-MRI may aid in improving the accuracy of delineation.

Materials/Methods: The pre-MRI imaging datasets of 10 patients underwent breast radiotherapy after breast conserving surgeries were utilized. All patients underwent postoperative CT scans in the same prone position as pre-MRI. Pre-MRI and CT automatically match through the automatic fusion system considered the nipple, the tip of scapula and the sternum as a co-registration point, besides manual alignment was given to enhance fusion consistency. Before contouring, each image was scored by cavity visualization score (CVS) criteria assigned (1-5). Three radiation oncologists and 2 radiologists with rich clinical experience delineated the clinical target volume (CTV-CT) for CT-based according to clinical experiences combined with other supplementary methods, such as seroma, clips, and other marks for clinical application in delineation. The gross target volume (GTV) of pre-MRI-based was determined by the volume of tumor acquired with 6 sequences: T1, T2, T2W-PAIR, DWI, dyn-eTHRIVE and sdyn-eTHRIVE, expanded 10mm to form the CTV-pre-MRI. Planning target volume (PTV) for each sequence was determined by CTV extended 15 mm, trimmed to 3mm from skin and to the breast-chest wall interface. Two measures of variability of the tumor bed delineation were developed: the mean volume and conformity index (CI).

Results: The mean volumes of CTV and PTV delineated with the use of CT were all larger than those delineated with pre-MRI. The mean reductions of tumor beds in CTV-pre-MRIs from CT were 20%; 43%, 13%, 47%, 35% and 37% and those in PTV-pre-MRIs were 12%, 23%, 10%, 25%, 21% and 16% for T1,T2, SPAIR, DWI, dyn-eTHRIVE and sdyn-eTHRIVE. The mean reductions in PTV-pre-MRIs were smaller compared with CTV-pre-MRIs. The mean CIs of CTV for CT, T1, T2, SPAIR, DWI, dyn-eTHRIVE, and sdyn-eTHRIVE were 0.18, 0.17, 0.31, 0.42, 0.47, 0.55, and 0.58. Meanwhile, CIs of PTV for all sequences were calculated: 0.48, 0.58, 0.75, 0.69, 0.75, 0.81, 0.84, indicating that the low inter-observer variability was observed from PTV, especially in sdyn-eTHRIVE sequence with high CVS in all sequences. Percentage overlap for PTV was significantly improved in the pre-MRI-based compared with the CT-based.

Conclusion: There can be substantial differences in delineation of the postsurgical radiotherapy target volume. MRI-delineated volumes are smaller than CT-delineated volumes with CVS increased. Pre-MRI provided a more precise depiction of the tumor bed with observers performed a smaller inter-observer variability than CT. Per-MRI, especially in sdyn-eTHRIVE sequence, should help in reducing treatment volumes with the improved accuracy for target volume delineation of preoperative radiotherapy of breast cancer.

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Delay in Initiating Postmastectomy Radiotherapy Is Associated with Inferior Survival Outcomes for Locally Advanced Breast Cancer Patients Treated with Neoadjuvant Chemotherapy and Mastectomy: A Multicenter Analysis

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Purpose/Objective(s): To evaluate the effect of the interval between surgery and the start of radiotherapy (SRI) on survival outcomes in locally advanced breast cancer treated with neoadjuvant chemotherapy followed by mastectomy and adjuvant chemotherapy.

Materials/Methods: A total of 1087 women treated with neoadjuvant chemotherapy and mastectomy between 2000 and 2014 from 11 hospitals were analyzed. All patients received adjuvant chemotherapy and radiotherapy. The median number cycles of adjuvant chemotherapy were 3 (range, 1-8). The patients were divided into early radiotherapy group (SRI < 18 weeks, n = 917) and delayed radiotherapy group (SRI > 18 weeks, n = 170) by using maxstat method. The Cox regression model and Propensity score-matched analyses (PSM) were used to test the effect of SRI on survival outcomes.

Results: With median follow-up of 72.9 months (range, 6.6-201.3 months), the 5-year disease free survival (DFS), and overall survival (OS) rates were 68.1% and 81.8%, respectively. In multivariate Cox regression analysis, hormone receptor status (P < 0.001), pathological T stage (P < 0.001), pathological N stage (P < 0.001), and SRI (P = 0.023) were independent risk factors for DFS. Hormone receptor status (P = 0.013), pathological T stage (P = 0.006), pathological N stage (P < 0.001), endocrine therapy (P = 0.013), and SRI (P = 0.001) were significantly associated with OS. After balancing the clinical and pathological factors with PSM, patients with SRI < 18 weeks had superior DFS and OS to those with SRI > 18 weeks. The 5-year DFS rate was 70.0% and 57.4% (P = 0.006), and OS rate was 84.0% and 69.8% (P = 0.002) for early and delayed radiotherapy group.

Conclusion: For locally advanced breast cancer patients treated with neoadjuvant chemotherapy followed by mastectomy and adjuvant chemotherapy, delay in initiating postmastectomy radiotherapy is associated with inferior survival outcomes, radiotherapy should be performed within 18 weeks after mastectomy.


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Adjuvant Radiation Therapy Alone is Associated with Improved Overall Survival Compared to Hormonal Therapy Alone in Elderly Women with Favorable Early-Stage Breast Cancer

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