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# The Analysis of Personalized Low-Dose Computed Tomography Protocol Based on Cumulative Effective Radiation Dose and Cumulative Organ Dose for Patients with Breast Cancer with Regular Chest Computed Tomography Follow up



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**Abstract :** Purpose: The aim of this study is to evaluate 2-year cumulative effective radiation dose and cumulative organ dose on regular follow-up computed tomography (CT) scans in patients with breast cancer and to establish personalized low-dose CT protocol. Methods and Materials: A retrospective study was performed on the patients with breast cancer who were diagnosed and managed consistently on the basis of routine breast cancer follow-up protocol between 2012-01 and 2016-06. Based on ICRP (International Commission on Radiological Protection) 103, the cumulative effective radiation doses of each patient for 2-year follow-up were analyzed using the commercial radiation management software (Radimetrics, Bayer healthcare). The personalized effective doses on each organ were analyzed in detail by the software-providing Monte Carlo simulation. Results: A total of 3822 CT scans on 490 patients was evaluated (age: 52.32±10.69). The mean scan number for each patient was 7.8±4.54. Each patient was exposed 95.54±63.24 mSv of radiation for 2 years. The cumulative CT radiation dose was significantly higher in patients with lymph node metastasis ($p = 0.00$). The HER-2 positive patients were more exposed to radiation compared to estrogen or progesterone receptor positive patient ($p = 0.00$). There was no difference in the cumulative effective radiation dose with different age groups. Conclusion: To acknowledge how much radiation exposed to a patient is a starting point of management of radiation exposure for patients with long-term CT follow-up. The precise and personalized protocol, as well as iterative reconstruction, may reduce hazard from unnecessary radiation exposure.

**Keywords :** computed tomography, breast cancer, effective radiation dose, cumulative organ dose
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