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Commentary on "Assessment of Radiation-induced Secondary Cancer Risks in Breast Cancer Patients Treated with 3D Conformal Radiotherapy"

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Letter to the Editor

Hassan Ali Nedaie et al., recently have published "Assessment of Radiation-induced Secondary Cancer Risks in Breast Cancer Patients Treated with 3D Conformal Radiotherapy" paper in Iranian journal of Medical Physics [1]. The aim of this study was to evaluate the secondary cancer risk in organs at risk for breast cancer radiotherapy by the 3D-CRT technique. The authors used BEIR VII model for measuring of excess absolute risk (EAR) and excess relative risk(ERR). This model was basically used for organs that received low dose (below 1-2 Gy) [2].

Based on the same paper, it's clear that organs like contralateral breast and ipsilateral lung, and heart received a high dose, about several Gy [3-5]. In Nedaie et al. paper, authors reported mean dose for thyroid, heart, contralateral breast and ipsilateral lung are ranged from 3.73 to 15.99, since BEIR VII model is not appropriate for high dose, hence, cancer risk estimation encounters an error. On the other hand, received dose for organs in field is inhomogeneously distributed, for changing inhomogeneously distributed dose to a homogeneous dose, the concept of organ equivalent dose (OED) has been applied. The OED was calculated using the Schneider paper, this model considered repair cells after radiotherapy, dose fractionation, dose–response curve, etc. Therefore, for estimating secondary cancer risk of organs in field that receive high dose, we should use OED model [6].

In addition to received dose, some risk factors like smoking can increase lung cancer risk, therefore adding smoking factor on calculation of baseline risk will estimate EAR accurately [7]. Also, during radiation therapy of breast cancer, heart has been irradiated, Exposure of the heart to ionizing radiation increases heart diseases like coronary diseases, myocardial infarction, and etc. [8], also smoking, parental history of myocardial infarction, and blood factors like blood pressure, high-sensitivity C-reactive protein, total cholesterol, high-density lipoprotein cholesterol, hemoglobin are involved in cardiovascular risk in women [9]. Therefore, nominated factors are able to increasing lung cancer and heart disease after radiation therapy for breast cancer.

The first shortcoming of this paper comes from using BEIR VII Model instead of OED model for organs in field that received high dose. Using this model to calculate cancer risk is resulted to have uncertainties in estimating the secondary cancer risk for organs in field that received high dose [10]. The second shortcoming of this paper comes from lack of considering smoking, parental history of myocardial infarction, and blood factors for estimating EAR of heart disease. The third shortcoming comes from using OED model for estimation secondary cancer risk of lungs without considering effects of smoking on lung cancer risk. It should be noted that for accurate estimation of lung cancer and heart disease after radiation therapy of breast, below formula is appropriate [11].

$$EAR = \delta * OED * Baseline\ Risk$$

Which δ is linearity of the rate of heart disease and lung cancer with increasing mean organ dose [8,12] and baseline risk obtains by Reynolds risk score which is including effects of blood factors, smoking, and parental history of myocardial infarction [9]. I hope that my comments help the better understand the usage of an appropriate model for estimation lung cancer and heart diseases risk in radiation therapy.

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