Breast Cancer is no longer considered a death sentence and the number of patients receiving radiotherapy is increasing every year. Advancements in RT technology allow more accurate and accumulated delivery of radiation with significantly reducing the risk of side effects. The use of these techniques has led to better clinical outcomes and significantly increased long-term sur-vival rates. Therefore second cancer risk after breast conserving therapy is becoming more important. In this study, we estimate the risks for developing a solid second cancer after radiotherapy of breast cancer using the concept of organ equivalent dose (OED).

CT scans of 8 breast cancer patients were retrospectively selected for this study. Three-dimensional conformal radiotherapy (3D-CRT), intensity modulated radiotherapy (IMRT), and volumetric modulated arc therapy (VMAT) were planned to deliver a total dose. Differential dose volume his-tograms (dDVHs) were created and the OEDs calculated. Second cancer risks of ipsilateral, contralateral lung and thyroid gland were estimated using line-ar, linear-exponential and plateau models.

The highest interest of our study was evaluation of secondary cancer risk for these multiple methodologies (3DCRT, IMRT and VMAT) of the organs of interest, which are located far from the treatment region and are very sen-sitive to the radiation exposure. Our results showed very high, about 3-fold higher for IMRT and about 9-fold higher for VMAT comparing with 3DCRT.

There is significant reduction of the EARs for the contralateral lung, ipsi-lateral lung and thyroid gland in 3DCRT plan relative to those for IMRT and VMAT in all dose–response models.