

BREAST CANCER

Radiation risk in *BRCA* carriers

BRCA1 and *BRCA2* (*BRCA1/2*) genes are involved in the repair of DNA breaks, which can be caused by ionizing radiation. Thus, women carrying a mutation in *BRCA1/2* likely have increased radiation sensitivity, as well as having an increased intrinsic risk of developing breast cancer. Therefore, these women are screened from a relatively young age to detect early stage breast cancer. Concerns have been raised that ionizing radiation used in several types of diagnostic procedures may increase the risk of breast cancer in these women. So far, only small studies have assessed radiation exposure from diagnostic procedures and breast cancer risk in *BRCA1/2* mutation carriers, and data have been inconsistent.

Anouk Pijpe led a large retrospective cohort study to assess diagnostic radiation exposure in over 2,000 *BRCA1/2* mutation carriers from France, the Netherlands, and the UK. Pijpe elaborates: “the GENE-RAD-RISK study is unique in the sense that it is the first study among *BRCA1/2* mutation carriers to have collected complete information on all types of diagnostic procedures using ionizing radiation.” Worryingly, this study demonstrated that exposure to diagnostic radiation before the age of 30 in *BRCA1/2*

carriers was associated with an increased risk of breast cancer. Pijpe continues, “our study showed that *BRCA1/2* mutation carriers have a 1.5-fold to almost twofold increased risk of developing breast cancer when exposed to one or more diagnostic radiation procedures, compared with carriers who were not exposed.” No increased risk of breast cancer was apparent for radiation exposure in women older than 30 years.

Pijpe puts the findings of this large cohort study into context, “fortunately, in some countries, such as the Netherlands, UK and France, breast cancer screening guidelines for *BRCA1/2* mutation carriers recommend avoiding mammographic screening before the age of 30, and use MRI as the main tool for surveillance in younger women but, in other countries, this is not always the case.” Crucially, the researchers observed an increased risk of breast cancer among *BRCA1/2* mutation carriers at dose levels considerably lower than those at which increases have been found in other radiation-exposed cohorts, including women from the general population.

Although prospective follow up to examine exposure to both low-dose and high-dose radiation and breast cancer risk in *BRCA1/2* mutation carriers is desirable,



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the researchers point out that prospective assessment of the association will be difficult. This difficulty is because the incident case numbers are not expected to increase rapidly owing to the greater uptake of prophylactic surgery among unaffected *BRCA1/2* carriers, and the relatively short follow-up time since DNA testing for *BRCA1/2* mutations became available. The researchers also highlight that “future research should focus on potential effects of diagnostic radiation exposure between age 30 and 50.” Ultimately, the findings of this study support the recommended use of non-ionizing radiation techniques for surveillance in young *BRCA1/2* mutation carriers.

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Original article Pijpe, A. *et al.* Exposure to diagnostic radiation and risk of breast cancer among carriers of *BRCA1/2* mutations: retrospective cohort study (GENE-RAD-RISK). *BMJ* doi:10.1136/bmj.e5660