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A Low-dose ionizing diagnostic radiation to the chest at young age may increase risk of breast cancer in BRCA1/2 mutation carriers

The Gene-Rad-Risk study reports that ionizing radiation delivered in the course of diagnostic procedures to the chest before age 30 may increase breast cancer risk in women who carry a mutation in the BRCA1 or BRCA2 gene. The findings of the study, coordinated by the International Agency for Research on Cancer in Lyon, France, were published today online in the British Medical Journal.

In the study (a three-country effort involving 1993 BRCA1/2 mutation carriers from France, the Netherlands, and the United Kingdom), subjects were asked to report whether they had ever been exposed, how many times and at which age and time period, to ionizing diagnostic radiation to the chest and/or shoulders. Diagnostic radiation procedures included fluoroscopies, X-rays, mammograms, CT scans, and other types like bone scans and nuclear diagnostic procedures. The study results show that BRCA1/2 mutation carriers have a 1.5- to almost 2-fold increased risk of developing breast cancer when exposed to one or more diagnostic radiation procedures, compared with carriers who were not exposed. This increased risk of breast cancer was observed for diagnostic radiation procedures received before age 30 and not for procedures later on in life.

“We observed increased risks 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. This is not entirely unexpected, though, because BRCA carriers, due to impaired DNA repair mechanisms, may be more susceptible to the damage caused by low-dose ionizing radiation than other women,” said Dr Ausrele Kesminiene, the coordinator of the Gene-Rad-Risk study.

Scientists emphasize, however, that BRCA1/2 mutation carriers need to continue to go for breast cancer screening.

According to study authors Dr Anouk Pijpe and Prof Dr Flora E. van Leeuwen from the Netherlands Cancer Institute in Amsterdam, the results of this study may have important implications for breast cancer screening practices among BRCA1/2 mutation carriers: “Carriers of a mutation in the BRCA genes have in any case an increased risk of developing breast cancer compared with women who do not carry such a gene mutation. Therefore, they are screened from a relatively young age to detect breast cancer at an early stage. Although some carriers have benefited from early mammographic screening, it now appears that screening at very early ages may increase the risk of breast cancer in these women. Fortunately, in some countries, like the Netherlands, the United Kingdom, and France, breast cancer screening guidelines for BRCA1/2 mutation carriers recommend avoiding mammographic screening before age 30 and using magnetic resonance imaging (MRI) as the main tool for surveillance at younger ages. But in other countries this is not always the case. Also, doctors may want to consider being cautious with the use of other diagnostic procedures using X-rays among young BRCA1/2 mutation carriers if alternatives are at hand.”

So far, only a couple of studies have been conducted on this subject (i.e. diagnostic radiation and breast cancer risk in BRCA1/2 carriers) and their findings were inconsistent. An important limitation of these previous studies is that they investigated only one type of diagnostic procedure, i.e. either chest X-rays or mammograms. 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 radiation procedures. Furthermore, the researchers calculated one combined measure to be able to analyse the effect of total diagnostic radiation dose.

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