

X-rays, Gamma Rays Added to Carcinogen List

BY KERRI WACHTER
Senior Writer

The addition of x-rays and gamma rays to a national list of carcinogens has prompted some concern among radiology professionals who worry that the inclusion could unnecessarily deter patients from undergoing diagnostic tests.

Three types of ionizing radiation—x-rays, gamma rays, and neutrons—were labeled as known carcinogens in the National Toxicology Program’s “11th Report on Carcinogens.”

“This is certainly not a surprise to anyone in this field,” said Richard L. Morin, Ph.D., chairman of the American College of Radiology’s (ACR) commission on medical physics.

The potential health effects of ionizing radiation have been acknowledged for more than 50 years. A number of agencies in the United States and worldwide—the Environmental Protection Agency, the Nuclear Regulatory Commission, and the World Health Organization—already recognize ionizing radiation as carcinogenic.

Yet the potential for this latest document to be sensationalized is of concern, particularly because it’s not clear how much ionizing radiation can potentially lead to cancer. Some researchers contend that there is a risk associated with x-ray or gamma ray exposure at any level. However, this is “somewhat controversial at the low levels that we’re talking about” in the medical setting, Dr. Morin noted.

It’s well established that at very high levels, x-rays and gamma rays are carcinogens. But when x-rays and gamma rays are used for diagnosis, “the levels are very significantly less than in any studies in which cancers have been produced,” Dr. Morin added.

“The report could lead patients to mistakenly believe that they are being placed at undue risk by undergoing a [radiologic] procedure, and cause many, who may des-

perately need care, to avoid seeking appropriate medical attention,” James Borgstede, M.D., chairman of the ACR Board of Chancellors, said in a statement.

When radiation exposure is performed appropriately, its benefits outweigh any accompanying risk. In addition, the total exposure is optimized to be as low as is reasonably achievable, David A. Schauer, Ph.D., executive director of the National Council on Radiation Protection and Measurements, wrote in an e-mail.

Advising a patient who has concerns about the cancer risk from x-ray or gamma ray procedures should include a discussion of the genuine need for such a diagnostic test and the real risks of not correctly diagnosing a condition, Dr. Morin said.

Without the diagnostic information provided by x-rays and other imaging tests, “there are only two other options,” Dr. Morin said. “One is to do nothing and wait and see if the patient gets worse.” The other is to do an exploratory surgery. “Clearly the risk associated with exploratory surgery is greater than the risk of diagnostic imaging,” he said.

The National Toxicology Program’s latest report emphasizes that the listing identifies potential cancer hazards but does not establish that a substance presents a cancer risk to an individual in daily life. The

report also does not attempt to weigh the potential benefits of exposure to certain carcinogenic substances in special situations, such as diagnostic testing. Nor does the report address acceptable dose ranges for diagnostic procedures.

The annual limit on public exposure from a single source of ionizing radiation is 100 mrem (1 mSv), both in the United States and internationally.

Medical applications are excluded from this limit in the United States. With the exception of mammography, there are no nationally set limits on radiation exposure. Mammography has an established maximum exposure limit of 300 mrem (3 mSv).

In perspective, the average person in the United States is exposed to about 360 mrem/yr (3.6 mSv/yr) from all sources of radiation, including cosmic and natural background radiation.

Radiation exposure from a medical procedure is generally minimal in terms of the biologic risk of developing cancer, Dr. Morin said. “Of all the risks there are in life to the patient, this is a very low one.”

Patient information about radiology topics is available at www.radiologyinfo.org, a Web site that is jointly sponsored by the ACR and the Radiological Society of North America. ■

Viruses Make List For First Time; Hepatitis Added

For the first time, a national list of known carcinogens includes several viruses.

Hepatitis B and C viruses and certain human papillomaviruses are listed as carcinogens in the National Toxicology Program’s recently released “11th Report on Carcinogens.” The report identifies agents that are known—or are reasonably expected—to cause cancer. The report is published every other year.

The report identifies only potential cancer hazards. It does not establish that a substance presents a substantial cancer risk to an individual in daily life.

The inclusion of the hepatitis B and C viruses was based on epidemiologic studies that have demonstrated that infections with either of these viruses can lead to liver cancer.

There also is some evidence to suggest that chronic hepatitis C infection may increase the risk of B-cell lymphoma.

The human papillomaviruses (HPVs) that were listed as carcinogens are of the genital-mucosal type. Epidemiologic studies have shown that these types cause cervical cancer. Case-control studies have reported strong associations of HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 58, and 59 with cervical cancer.

In particular, cohort studies have shown that infection with HPV-16 or with high-risk HPVs as a class occurs before the development of high-grade cervical intraepithelial neoplasia, which is thought to be a precursor of invasive cancer.

HPV-16 has also been associated with other anogenital cancers, especially cancer of the vulva. ■

Typical Doses for Diagnostic Procedures Add Little Cancer Risk

Diagnostic procedure	Effective doses (mSv) clustering around a value of:	Equivalent period of natural background radiation	Lifetime added risk of cancer per exam*
X-ray of chest, teeth, arms, legs, feet	0.01	A few days	Negligible risk
X-ray of skull, head, neck	0.10	A few weeks	Minimal risk (1 in 1,000,000 to 1 in 100,000)
Breast x-ray mammography; x-ray of hip, spine, abdomen, pelvis; CT of head; lung nuclear medicine isotope scan; kidney isotope scan	1.00	A few months to a year	Very low risk (1 in 100,000 to 1 in 10,000)
X-ray of kidney and bladder (IVU); stomach x-ray—barium meal; colon x-ray—barium enema; CT of abdomen; bone isotope scan	10.00	A few years	Low risk (1 in 10,000 to 1 in 1,000)

*These risk levels are added to the one-in-three chance we all have of getting cancer.
Source: U.K. National Radiological Protection Board

Prophylactic Mastectomy Lowers Risk of Breast Cancer 90%

BY BRUCE JANCIN
Denver Bureau

SAN ANTONIO — Prophylactic mastectomy results in an adjusted 90% reduction in the risk of breast cancer, according to new results from the world’s largest prospective study of the procedure.

During a median follow-up of 4.1 years in the Rotterdam Prophylactic Mastectomy Study, there has been just one case of breast cancer detected among 124 high-risk *BRCA1* or *BRCA2* mutation carriers who underwent the surgery, reported Jan G.M. Klijn, M.D., during a breast cancer symposium that was sponsored by the

Cancer Therapy and Research Center.

In contrast, 23 of 202 similarly high-risk women who had opted for aggressive surveillance in lieu of prophylactic mastectomy have developed the malignancy during a median 3.6 years’ follow-up.

Two of the women died of breast cancer before age 30, according to Dr. Klijn of Erasmus University, Rotterdam, the Netherlands.



Eighty percent of the participants in the study carried a *BRCA1* mutation. The rest of the participants were found to be *BRCA2* positive, the researchers said.

Chemopreventive tamoxifen therapy and prophylactic oophorectomy cut risk 40% and 50%, respectively.

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have been three reported cases of breast cancer following prophylactic mastectomy in 255 *BRCA1* or *BRCA2* mutation carriers

in the studies. Two of the three cases involved metastatic breast cancer. The capacity to metastasize is a characteristic of all malignant tumors.

In each of the three studies, prophylactic mastectomy reduced the risk of breast cancer by at least 90%. Those results make prophylactic mastectomy the most effective available preventive measure.

In comparison, chemopreventive tamoxifen therapy was reported to yield an approximate 40% reduction in breast cancer risk. Patients who have prophylactic oophorectomy are said to achieve a 50% reduction in the risk of breast cancer, Dr. Klijn said. ■