Understanding Radiation Risk from Imaging Tests

In large doses, radiation can cause serious tissue damage and increase a person's risk of later developing cancer. The low doses of radiation used for imaging tests might increase a person's cancer risk slightly, but it's important to put this risk into perspective. Here are answers to some of the more common questions people have about radiation risks linked to imaging tests.

How much radiation is the average person exposed to in day-to-day life?

We are constantly exposed to radiation from a number of sources, including radioactive materials in our environment, radon gas in our homes, and cosmic rays from outer space. This is called *background radiation* and it varies across the country.

The average American is exposed to about 3 mSv (**millisieverts**) of radiation from natural sources over the course of a year. (A millisievert is a measure of radiation exposure.) But background radiation exposure varies throughout the United States, and the world.

The largest source of background radiation (typically about 2 mSv per year) is radon, a natural gas found in our homes. Radon levels vary greatly from one part of the country to another.

Location also plays a role because the earth's atmosphere blocks some cosmic rays. This means being at a higher altitude increases a person's exposure. So, people living in the higher parts of New Mexico and Colorado are exposed to more radiation per year (about 1.5 mSv more) than people living closer to sea level. And a 10-hour airline flight increases cosmic ray exposure by about 0.03 mSv.

How much does an imaging test expose a person to radiation?

The amount of radiation exposure from an imaging test depends on the imaging test used and what part of the body is being tested. For instance:

- A single chest x-ray[1] exposes the patient to about 0.1 mSv. This is about the same amount of radiation people are exposed to naturally over the course of about 10 days.
- A mammogram[2] exposes a woman to 0.4 mSv, or about the amount a person would expect to get from natural background exposure over 7 weeks.

Some other imaging tests have higher exposures, for example:

- A lower GI series using x-rays of the large intestine exposes a person to about 8 mSv, or about the amount expected over about 3 years.
- A CT scan[3] of the abdomen (belly) and pelvis exposes a person to about 10 mSv.
- A PET/CT[4] exposes you to about 25 mSv of radiation. This is equal to about 8 years of average background radiation exposure.

Keep in mind that these are estimates for an average-sized adult. Studies have found that the amount of radiation you get can vary a great deal.

What can I do if I'm worried about radiation from imaging tests?

If you have concerns about the radiation you may get from a CT scan, PET scan, or any other imaging test that uses radiation, talk to your health care provider. Ask whether the test is needed and if it's the best one to use in your case. You may also want to know what you and your health care provider can expect to learn from it.

The best advice at this time is to get only the imaging tests that are needed and try to limit your exposure to all forms of radiation. If you do need to have a test that will expose you to some radiation, ask if there are ways to shield the parts of your body that aren't being imaged. For example, a lead apron can be used to protect parts of your chest or abdomen from getting radiation, and a lead collar (known as a thyroid shield or thyroid collar) can be used to protect your thyroid gland.

You may also want to keep a medical imaging record to track your own history of imaging tests and share it with your health care providers. This may help prevent repeat tests from being ordered. English and Spanish examples of imaging records for adults

can be found online at www.imagewisely.org[5].

Remember that MRI and ultrasound exams do not expose you to radiation.

What about radiation from imaging tests and children?

Children are more sensitive to radiation than adults. Because of this, health care providers are careful to reduce radiation exposure to pediatric patients for imaging tests that use radiation. Still, parents can and should ask questions before any imaging tests are done.

Here are some questions to ask:

- Why does my child need an imaging test?
- What type of imaging test do you think my child needs?
- Does it use radiation?
- Are there other options that don't use radiation?
- Can the amount of radiation used be adjusted for my child's size?

Again, the benefits of the test should outweigh the risks of radiation exposure.

You may also want to keep a medical imaging record to track your child's history of imaging tests and share it with their health care providers. An English version for children can be found online at www.imagegently.org[6].

How much does the extra radiation increase a person's cancer risk?

Radiation exposure depends on the type of test done, the area of the body exposed, the person's body size, age, and gender, and other factors.

Radiation experts believe that if imaging tests do increase the risk of cancer, the increase in risk is likely to be very small. Still, it's hard to know just how much radiation exposure from imaging tests might increase a person's cancer risk. Most studies on radiation and cancer risk have looked at people exposed to very high doses of radiation, such as uranium miners and atomic bomb survivors. The risk from low-level radiation exposure is not easy to calculate from these studies. We do know that children are more sensitive to radiation and should be protected from it as much as possible.

Because radiation exposure from all sources can add up over a lifetime, and radiation

can, indeed, increase cancer risk, imaging tests that use radiation should only be done for a good reason. In many cases, other imaging tests such as ultrasound or MRI may be used. But if there's a reason to believe that an x-ray, CT scan, or nuclear medicine scan (such as a PET scan) is the best way to look for cancer or other diseases, the person will most likely be helped more than the small dose of radiation can hurt.

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/x-rays-and-other-radiographic-tests.html
2. www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/mammograms/mammogram-basics.html
3. www.cancer.org/treatment/understanding-your-diagnosis/tests/ct-scan-for-cancer.html
4. www.cancer.org/treatment/understanding-your-diagnosis/tests/nuclear-medicine-scans-for-cancer.html
5. http://www.imagewisely.org/
6. http://www.imagegently.org/

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