Full-Body CT Screening: Preventing or Producing Cancer?

Full-body computed tomography (CT) screening may constitute more of a cancer risk than a cancer foil, say researchers who, in a new study, liken the radiation exposure during a single scan to that experienced within miles of a World War II atom bomb explosion.

Although the research is being hailed by groups who do not support such screening, which is unregulated and varies considerably in quality, others say there is still a place for more conservative and cautious practitioners who can screen patients efficiently from the shoulders to the pelvis for a number of cancers, including lung and colon cancer, as well as heart disease and other health threats.

“Full body CT screening definitely has a place, but it needs to be used intelligently,” said Max Rosen, M.D., an associate professor of radiology at Harvard Medical School in Boston and medical director of Be Well Body Scan in Chestnut Hill, Mass., a walk-in scanning facility that is owned by Beth Israel Deaconess Medical Center.

The issue also involves the stand-alone imaging businesses that have popped up across the country that offer elective full-body CT screening through direct-to-consumer marketing. These facilities have doubled in number over the last several years and are a popular option for the “worried well” who are willing to pay an average of $1,000 to ensure that their aging bodies are not harboring tumors or other incipient diseases.

Groups such as the American College of Radiology and the U.S. Preventive Services Task Force have said that there is no evidence that these screens offer long-term benefits and that they, more often than not, lead to expensive follow-up testing for suspicious findings—exams that are often negative but that can be worrisome to patients and risky to perform, such as lung biopsies.

The only known ongoing academic study of full-body CT scanning suggests that the benefit of such screening, if there is a benefit at all, is small, whereas the incidence of unnecessary follow-up exams is large. A University of California at San Diego study of 1,192 private full-body CT screening clinics, presented in December 2002 at a radiological meeting, found that 46% of scans required follow-up tests, but only 1% of the scans found a life-threatening condition.

Radiology associations have focused on a different issue, the risk of radiation exposure from the scans, which fire X-rays into the body from different angles and directions to obtain three-dimensional images. But critics of full-body CT scanning had little hard data to rely on—until now.

In a study published in the September issue of Radiology, David Brenner, Ph.D., a professor of radiation oncology and public health at Columbia University in New York, estimated the dose of radiation to the lung or stomach from a single full-body CT scan to be 14–21 milligrays (mGy, a unit of absorbed radiation). That corresponds to a dose region—about 1.5 miles from the blast of an atomic bomb—for which there is direct evidence of increased mortality among atomic bomb survivors, Brenner said. The exposure is “equal to 100 chest X-rays or 100 mammograms,” he said.

Using those figures, Brenner and his Columbia University colleague, Carl Elliston, both of whom are physicists, calculated that a 45-year-old person who has one full-body CT scan would have an additional lifetime risk of dying from lung cancer resulting from radiation exposure of about 1 in 2,000. That person’s excess risk of dying from all cancers combined would be 1 in 1,200.

Brenner and Elliston then looked at annual full-body scanning and estimated that if that same person got one scan a year for 30 years, or 30 total scans, his or her excess lifetime risk of dying from lung cancer resulting from the radiation exposure would increase to almost 1 in 80. The excess risk of dying from any cancer for that person would be 1 in 50, they estimated.

“Now we have a risk profile for elective full-body screening, but not a benefit profile,” Brenner said. “We are supposed to practice evidence-based medicine and to do no harm.”

The study echoes warnings about full-body CT scanning made by the U.S. Food and Drug Administration, which by law cannot ban the practice. Use of CT machines for screening is “an off-label use of an approved medical device, and the FDA does not regulate the practice of medicine,” said Thomas Shope, Ph.D., a radiation physicist in the FDA’s Center for Devices and Radiological Health. “Our concern about CT radiation is longstanding, and all we can do is put...
out brochures, have a Web site, and work with states, a few of which are now looking at some limitations,” Shope said. “We have done all the nonregulatory measures we can, and the results of this study, which are not a surprise to us, may grab the public’s attention.”

Comparing CT screening to the danger of an A-bomb is “misleading and inflammatory,” said Elliot Fishman, M.D., a professor of radiology and oncology at Johns Hopkins Medical Institutions in Baltimore. “The dose calculations they had are incorrect. They are way too high, considering the most modern machines, and comparing it to an atomic bomb blast is very tenuous.”

James Borgstede, M.D., chairman of the American College of Radiology’s Board of Chancellors, said that, although some may question comparisons to victims of Hiroshima, the study “qualitatively illustrates the fact that we are concerned about the doses of radiation delivered when there is no documentation of benefit to the population at large.”

Fishman and Harvard’s Rosen further argue that no one recommends that a person be screened with a full-body CT scan every year, the standard Brenner used in calculating cumulative dosage. “Even the worst entrepreneurs in shopping mall scanning units would not suggest a yearly scan,” Fishman said. “The comparison is really unhelpful, like saying if you take 30 times the dose of a medication, you will die.”

Brenner replied that he doesn’t know “what people ask for” and that no one knows what the “optimal exam frequency would be, as no studies have been done.”

“We chose to report annual scans, taking the analogy with the recommendations for mammography, which also is designed to pick up cancers early,” he said. Even if the scan was done every 2 years from ages 45 to 70, the risk of dying of cancer caused by radiation would still be very high—1 in 100, Brenner said.

Fishman and Rosen say that full-body CT scanning can be beneficial when conducted by experienced radiologists who use the highest-quality scanners and who recognize what is normal in an aging body. “For example, we know that 10% of women will have a lung hemangioma that does not need follow-up,” Fishman said.

In experienced hands, a scan would combine a number of advanced screening tests, such as lung screening if a patient is a former smoker or virtual colonography if a patient is older than age 50. “Whole body screening is pretty impressive and can be part of a comprehensive health package that includes cholesterol screening, mammography, and other tests,” Fishman said. “The trick is to separate out the hoopla noise and the entrepreneurs who operate high-profit centers.”

Rosen said that in about 1,500 scans, he has found many patients with colon polyps that need to be removed, some with lung cancer, several with premalignant masses in their pancreas, and one with a premalignant tumor in the thymus, and he has found more cases of heart disease than can be found by checking coronary calcium. Fishman will only screen patients referred to him by physicians, but, when asked, added that he has had a chest CT scan himself, and many Hopkins doctors have had full-body scans. Rosen, who has also had a full-body scan, allows patients to refer themselves for a full-body CT screening.

“I sit down with [patients] and carefully go through their medical history, and I make sure they understand what the benefits of the screen are, but, more importantly, the limitations of what we can check,” Rosen said. He also tells them that radiation from a single scan constitutes the amount that a person living in Boston receives from “background radiation” every 5 years, or it is one-third of what Rosen himself is allowed to absorb each year on the job. “If the scan looks great, I tell them not to come back for at least 5 years. And 99.9% of patients are grateful for the knowledge,” he said.

But the American College of Radiology’s Borgstede argues that Fishman and Rosen are offering “targeted CT screening” that is dependent on a patient’s risk factors. It is not the kind of “mall screening where people are put in machines and run through” without undergoing preparation for virtual colonographies or other more sophisticated scans, he said. Instead of having a full-body scan, he said, patients older than age 50 should be screened for colon cancer with routine methods, and if patients are worried about lung cancer, “they should first quit smoking, and then participate in a national clinical trial that is looking at the value of CT screening for lung cancer,” Borgstede said. (Borgstede is referring to the National Cancer Institute’s National Lung Screening Trial that is comparing the effect of CT lung screening with that of chest X-ray screening on overall and disease-specific mortality.)

However, a recent survey suggests that Borgstede’s advice will not be followed. A study published January 7 in the Journal of the American Medical Association found that 86% of 500 middle-aged men and women surveyed were interested in a full-body CT scan after being given a short description of its purpose. When offered a choice of $1,000 or the scan, 85% chose the scan.

—Renee Twombly