Medical Radiation: Fret or Forget?

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Exposure to radiation from medical tests has received a lot of attention recently. The concern has arisen from three different sources: 1.) a report on increased use of medical procedures involving radiation in the US;[1] 2.) concerns that medical radiation could increase patient risk for developing cancer;[2] and 3.) articles in the popular press about high doses of radiation administered inadvertently resulting in patient complications such as hair loss and confusion.

A study published by the National Council on Radiation Protection and Measurement in 2009 reported that the average radiation exposure of the US population (from background radiation including radon and cosmic rays as well as medical radiation and occupational exposures) had increased from 3.6 millisieverts in the 1980s to 6.6 millisieverts in 2006.[1] The majority of this increase was due to medical radiation exposure, both from more medical procedures performed and increased radiation per procedure for newer tests. What are these medical procedures? Nuclear medicine tests, (primarily of the heart) account for approximately 5% of medical imaging procedures but 26% of the medical dose. CT scans account for 17% of medical imaging procedures and 49% of medical dose.[3]

The principle concern of increased radiation exposure is cancer induction, primarily in patients less than 40 years old, particularly children. This data is based on studies of atomic bomb survivors (who received much higher doses than current imaging tests) with extrapolations of risk to the lower doses used in medical tests. These extrapolations are controversial. For example, do multiple exposures to low dose radiation equal the same risk as one exposure to a high dose? How about if there is a long interval between these low-dose exposures?

Unfortunately, what has not been well described in the current debate is the impact imaging tests have had on improving patient care. For example, CT has virtually eliminated the need for exploratory surgery and is routinely used to non-invasively diagnose cancer, ruptured brain aneurysms, appendicitis and internal organ damage in trauma patients. What is concerning, is when patients refuse an imaging test over concerns about radiation, when the test can improve their care and even be lifesaving.

Regulation of medical imaging devices which use radiation varies by state. In Rhode Island the Department of Health has regulations regarding x-ray tube registration, room shielding and monitoring radiation exposure to staff operating the equipment. There are not currently regulations regarding dose emitted by medical devices and the situation is complicated by the fact that different specialties are using medical imaging devices (radiology and cardiology for example). This is changing. Governmental agencies are investigating reporting and regulation of medical radiation and in September 2010, California passed a law requiring: 1.) reporting of the radiation dose per exam; 2.) reporting overdoses to the state; and 3.) requiring accreditation of medical imaging facilities. Manufacturers of medical imaging equipment are designing new equipment to lower the radiation dose per test, create warnings if doses exceed a certain level and report radiation dose into the electronic medical record. Insurance companies in some states will require that imaging devices be accredited by their governing body (the American College of Radiology for example).

- What can you tell your patients about radiation? There are several practical steps patients can take to minimize their exposure to radiation.
- Confirm with their health care provider that the test is truly necessary.
- Ask if there are alternative tests which can provide the same information without radiation.
- Report all imaging tests performed in the past to avoid unnecessary repeat tests.
- Ask if the imaging machines are accredited by a national agency such as the American College of Radiology.
- Give an accurate history to the person performing the test. Imaging protocols vary depending on what the clinical question is. For example a CT scan for kidney stones may have 30% less radiation than a "normal" CT scan of the same body part.
- Ask if the imaging facility uses low dose protocols, particularly for children.

In conclusion, while there is concern for exposing patients to unnecessary radiation, for the proper indication, the benefits obtained from imaging technologies usually far outweigh the risks. This being said, referring physicians and patients should scrutinize both the need for the test and the nature of the test being performed to make sure that it is optimized for their medical treatment.

References

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