AAPM Response to Use of Lead Aprons in Mammography

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For the General Public

Personal shielding, also called lead aprons, is given to patients undergoing some medical imaging exams to decrease the amount of radiation to internal organs. Lead aprons help to reduce, but not eliminate, stray radiation that arises during exams. The use of lead aprons is voluntary. It is the right of any patient to ask for a lead apron. However, in most cases lead aprons offer little extra benefit, and in some cases can actually interfere with the clinical exam.

There has been recent emphasis in the media on the use of lead aprons for women having a mammogram. In the media two types of lead aprons have been discussed – lap aprons and thyroid aprons. There is considerable scientific evidence showing that lead aprons result in only minimal dose reductions in mammography. Mammography machines are designed to ensure patient safety, incorporating internal radiation shielding, which prevents stray radiation. The use of thyroid shields is never recommended, as thyroid shields may interfere with the mammogram. The use of a lap apron is only recommended if a woman is pregnant or thinks she may be pregnant.

For Medical Professionals

The American Association of Physicists in Medicine (AAPM) represents over 7,500 professionals responsible for ensuring safe and efficacious application of imaging technologies, including breast imaging. All mammography systems include shielding to protect the other organs of the body. A qualified medical physicist tests every mammography unit annually. One test is specifically designed to confirm that the x-ray beam is properly aligned with the chest wall so that only breast tissue is exposed during the imaging examination. This test is mandated by the U.S. Food and Drug Administration (FDA), and any variance from compliance must be addressed by the imaging center within 30 days.

In general, the use of additional shielding (lead aprons) is unnecessary. The use of thyroid shields during mammography exams is unsupported by the scientific literature, and could result in unnecessary increases in breast dose due to repeated mammography exams. Thus the use of thyroid shields is strongly discouraged. The use of lap shields is voluntary and is only recommended in women who are or may be pregnant at the time of the exam.

Thyroid Shields

In 1980, CRC Press published the Handbook of Radiation Doses in Nuclear Medicine and Diagnostic X-Ray, which considered dose to the thyroid due to mammography "negligible relative to the absorbed dose to the female breasts" during the examination (page 211, Table 120). In the 1999 paper by Whelan et al. (Australasian Radiology 43: 307-310) thyroid organ doses were measured to be 0.04 mGy for a total screening mammographic examination consisting of 2 views (CC & MLO) per breast. That study has been supported recently, by the work of Sechopoulus et al. (Radiology 246: 434-443). For context, a dose of 0.01 mGy is typical of the background radiation dose obtained every day. A 1988 study published in the Journal of Clinical Endocrinology and Metabolism found no significant increase in diagnosed thyroid nodules in patients who had received an estimated thyroid dose of 600 mGy (Kaplan et al; 66: 376-382). Thus, the radiation dose to the thyroid in mammography is deemed to be negligible.

More importantly, thyroid shields are cumbersome. Thyroid shields interfere when technologists position patients for mammograms. Proper positioning of the patient is critical to obtaining a high quality mammogram. Improper positioning will reduce the amount of breast tissue visible to the interpreting radiologist, reducing the efficacy of the exam. Thyroid shields may also be visualized in the mammogram. Both of these scenarios will require a repeat mammogram, unnecessarily doubling the breast dose for that view.

Lap Shields

The radiation dose to the internal organs of the abdomen is minimal in radiography. This is supported by multiple publications including the Handbook of Radiation Doses and the work of Sechopoulus. Of greatest concern would be the dose to the uterus and fetus (if the patient was pregnant). However, most studies describe the uterus organ dose as "unmeasureable". Thus the use of a lap shield such as a lead apron to cover the abdomen of women undergoing mammography is neither necessary nor recommended.

However, unlike thyroid shields, lead aprons that cover the abdomen of the patient do not generally interfere with imaging. As a result, we support the right of the patient to request the use of a lead apron designed for use over the abdomen. Abdomen shields have been shown to reduce internal organ doses by approximately 50% (Sechopoulus et al.). Thus, abdomen shields can be used to mitigate the small dose that women may receive. Abdomen shields would also reduce the dose that a fetus may receive. Lead aprons should only be given to a patient at their request and not routinely as part of the imaging protocol.
The AAPM is a scientific and professional organization, founded in 1958, composed of scientists whose clinical practice is dedicated to ensuring accuracy, safety and quality in the use of radiation in medical procedures such as medical imaging and radiation therapy. Medical physicists, as they are generally known, are uniquely positioned across medical specialties due to their responsibility to connect the physician to the patient through the use of radiation producing technology in both diagnosing and treating people. The responsibility of the medical physicist is to assure that the radiation prescribed in imaging and radiation therapy is delivered accurately and safely. One of the primary goals of the AAPM is the identification and implementation of improvements in patient safety for the medical use of radiation in imaging and radiation therapy. To learn more about AAPM, visit www.aapm.org.