X-ray shields going by the wayside: What you and your patients need to know
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Since the 1950s, radioprotective shields have been used routinely when performing X-ray studies in children to decrease radiation exposure and reduce the risk of passing radiation-induced mutations to future generations.

The lead shield - actually no longer made of lead - lies just off the edge of the X-ray exposure or at some distance such as when taking an X-ray of the chest or cervical spine. Sometimes, it lies in the field of exposure like when shielding ovaries for a pelvis or abdomen X-ray.

Recent scientific evidence, however, has prompted major medical and scientific imaging organizations to reassess the benefits of protective shielding. In April 2019, the American Association of Physicists in Medicine published a position statement that recommends limiting the routine use of patient gonadal and fetal shielding during X-ray-based diagnostic imaging (http://bit.ly/2PoIE0s). The statement was endorsed by numerous organizations, including the American College of Radiology, the Image Gently Alliance, the Health Physics Society, the Canadian Organization of Medical Physics and the Canadian Association of Radiologists.

In January, the New York Times published an article on the new recommendations titled "That Lead Apron in the X-ray Room?" (https://nyti.ms/2tgJpRf). The article highlighted the growing practice of "yielding the shield" - not routinely shielding the gonads - especially at many children's hospitals.

Reasons for the shift

A combination of technical advancements and biological considerations is behind this change.

Since the 1950s, advances in imaging technology have reduced gonad exposure up to 95% without loss in X-ray quality. Another technological advancement called automatic exposure control uses sensors to prevent unnecessary over-exposure to radiation. However, if a gonadal shield covers the sensors, the equipment won't be triggered to stop. The result is a slightly longer exposure and more radiation to the entire area and other radiation-sensitive areas.

Current understanding is that, in general, gonads are less sensitive to radiation than was thought decades ago and less sensitive than other organs. Studies of progeny from those exposed to high levels of radiation, such as from the atomic bomb, have not demonstrated radiation-induced heritable effects with statistical significance.

Furthermore, the location of the gonads, especially the ovaries, varies widely. Therefore, shielding may be incomplete in more than 50% of cases when shields are placed based on surface landmarks; this includes situations in young boys where the testes may be above the scrotum. In addition, young children may wiggle and displace the shield from the gonads when the technologist steps away to take the X-ray.

Despite shielding, the gonads will be exposed to normal scatter (ricocheting) of X-rays within the body. And, importantly, a shield will block that portion of the picture, potentially affecting the ability to make an accurate diagnosis.

Does this mean shielding should no longer be used?

Exceptions can be made if a parent/caregiver requests a shield and it is of psychological benefit. In these situations, the radiology practice should have guidelines and communication strategies to enable the requesting caregiver to understand the benefits and disadvantages of shielding. For example, the parent/caregiver should...
be made aware that using a shield outside the area to be X-rayed provides no benefit since shields do not prevent the small amount of internal scatter.

Changing from routine to exception-based gonadal shielding during pediatric X-ray studies will be challenging due to expectations of those who place shields and those who get shields. This change will require education of all members of the imaging team, including health care providers in intensive care units, newborn nurseries and outpatient settings. In addition, medical professionals must recognize that other imaging professionals such as dentists may have different practices, sometimes guided by different requirements.

_Drs. Frush and Reid are members of the AAP Section on Radiology._

**Resource**

- FAQs from the American Association of Physicists in Medicine on patient gonadal and fetal shielding in diagnostic imaging