THE SAFETY OF DIAGNOSTIC IMAGING DURING PREGNANCY

A Provider's Guide

Maternal illness during pregnancy that requires radiographic imaging is not uncommon. However, concerns regarding the safety of needed tests either by the patient or the physician may either delay or defer needed evaluations. There are several areas of concern with exposure to radiographic imaging during pregnancy: teratogenicity or birth defects, and risk of further malignancy development.

According to the American College of Obstetricians and Gynecologists, "With few exceptions, radiation exposure through radiography, CT scan, or nuclear medicine imaging is at a dose much lower than the exposure associated with fetal harm." (ACOG, 2016). Therefore, the risk from exposure should not delay the use of appropriate imaging studies. Other means of diagnosis, MRI and ultrasound, are also not associated with known adverse fetal effects and should be considered when appropriate.

Birth Defects

The most common adverse effects from human exposure to high-dose radiation exposure include growth restriction, microcephaly, and intellectual disability. (ACOG, 2016). Data from the atomic bombs dropped on Hiroshima and Nagasaki revealed the potential adverse impact of radiation on a developing fetus. When exposed during the critical period, 8-15 weeks after conception (10-17 weeks gestation), there is a potential for an increased risk for birth defects, primarily of the central nervous system. An increase in fetal growth restriction and fetal malformations have been noted in cases of exposure over 60-310 milligrays (mGy) of radiation, and severe intellectual disability is seen with exposure of 610 mGy or higher (ACOG, 2016). Less than 100 mGy during gestation is considered safe (Tremblay, et al). The typical chest x-ray has an estimated fetal dose of 0.01 mGy per examination, with more than 10,000 x-rays needed to reach the cumulative 100 mGy threshold. On the other hand, a pelvic CT has an estimated fetal dose of up to 50 mGy per examination and, if possible, should be avoided during the period of critical central nervous system sensitivity of 10- 17 weeks gestation (ACOG, 2016).

The use of gadolinium-based contrast for MRI should be avoided, as these agents have been found to be teratogenic at high doses, and they cross the placenta into the fetal circulation and the amniotic fluid (Chen, 2008). Use of radioactive iodine is contraindicated during pregnancy because it crosses the placenta and adversely affects the fetal thyroid. Fetal thyroid function begins at 10-12 weeks gestation and radioactive iodine is concentrated in the fetal thyroid at a rate of 20-40 times that of the mother.

Radiation-Induced Cancer

The risk of developing cancer after prenatal exposure to ionizing radiation is unclear, but is likely small. It is estimated that prenatal exposure to a 1-2 rad dose will increase the risk for leukemia from 1 in 3000 to 1 in 2000.

Summary

1. Exposure to a single diagnostic test is extremely unlikely to result in harmful fetal effects, provided total radiation exposure is less than 50 – 100 mGy.
2. Consider alternate methods of diagnosis, such as MRI and ultrasound, when appropriate.
3. If radiographic imaging is necessary, try to avoid the critical period (10-17 weeks gestation) if possible. However, if these techniques are necessary for the diagnosis in question, they should not be withheld from a pregnant patient at any gestational age.
4. Use of radioactive iodine is contraindicated during pregnancy.
5. Use of gadolinium-based contrast should be discouraged, and limited to situations in which the benefits clearly outweigh the possible risks.
6. It may be useful to consult with a medical physics expert, radiology, or a maternal fetal medicine specialist, to best determine the exposure risk for a patient during pregnancy.

References

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