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 three main areas of concern with exposure to radiographic imaging during pregnancy: teratogenicity or birth defects, cancer, and germline mutations in the exposed fetus.

According to the American College of Radiology, "No single diagnostic procedure results in a radiation dose that threatens the well-being of the developing embryo and fetus." 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**

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 microcephaly and mental retardation has been noted in cases of exposure over 50 rads of radiation. Less than 5 rads during gestation is considered safe. The typical chest x-ray has an estimated fetal dose of 0.00007 rad per examination, with more than 71,000 x-rays needed to reach the cumulative 5 rad threshold. On the other hand, a fluoroscopic barium enema has an estimated fetal dose of almost 4 rads per examination and, if possible, should be avoided during the period of critical CNS sensitivity of 10-17 weeks gestation.

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.

**Germline Mutations**

One concern raised with exposure to ionizing radiation is the risk of new mutations, which have the potential to affect future generations. Again, data collected from exposed pregnancies from Hiroshima and Nagasaki did not show an increase in new mutations or genetic conditions. Data show that radiation exposure of 50-100 rads would approximately double the baseline mutation rate.

**Summary**

1. Exposure to a single diagnostic test will not result in harmful fetal effects.
2. Consider alternate methods of diagnosis, such as MRI and ultrasound, when appropriate.
3. If testing is necessary, try to avoid the critical period (10-17 weeks gestation) if possible.
4. Use of radioactive iodine is contraindicated during pregnancy.
5. Up to 5 rads of exposure over the course of the pregnancy is considered safe.
6. It may be useful to consult with a medical physics expert.

**References**


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