Radiographic Exam for the Pregnant Dental Patient

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The universe and our industrialized world give off a certain amount of radiation per day (the average effective dose for a member of the US population is 8 mSv a year). If the amount of radiation in a single plain film radiographic examination was to be compared to the radiation an individual receives from natural and artificial sources every day, it would negligible.

The effects of a dental radiograph on the unborn child

• The risk to the fetus from a few mSv of radiation exposure arising from a dental radiographic procedure is extremely small.
• The cancer risk to the unborn child resulting from a 10 mSv fetal dose is several thousand times less than the background risk of childhood cancer.
• The risk of inducing a genetic abnormality is an even smaller fraction of the background risk of genetic disorder.

The effects of high doses of radiation on the unborn child

The adverse effects that may occur to the fetus of an expectant mother irradiated with high doses of radiation depend upon the stage of the menstrual cycle and the dose of the ionizing radiation given. In the most vulnerable time is during the first trimester:
• During implantation of the fertilized ovum: If a dose of 0.2 Gy or higher is given, death of the embryo may occur.
• In the second or third trimester of pregnancy (organogenesis): a dosage of 0.2 Gy may cause macroscopic anatomical malformations.
• Between 8-15 weeks (fetogenesis): this is a period of high radiosensitivity for the developing central nervous system. Research has shown that a dosage of 1 Gy during this period would result in a prenatal retardation of 50% of fetuses studied.
• The fetal dose from a dental X-ray examination has been estimated to be between 0.3 mSv and 3 mSv.

Precautions to be taken when subjecting a pregnant patient to radiation

1. Information on possible pregnancy should be obtained from the patient. A female of reproductive capacity should be considered pregnant unless proved otherwise.
2. If the patient is pregnant the possibility of obtaining information from a non-radiological investigation should be considered.
3. If the radiological examination is considered essential it should be performed and due consideration should be given to optimisation.
4. Observation of the “Ten-Day Rule”: Any woman of childbearing age to be subjected to diagnostic X-ray examination that may reach the abdominal or pelvic areas should be exposed only during the first ten days after menstruation.
5. Because of the widespread “fear” of radiation induced damage to the unborn child, it is reasonable to counsel the woman on level of radiation exposure and associated risks prior to performing the procedure.
6. The maxillary occlusal view or any other view that requires the X-ray beam passing down into the abdominal area should be avoided if proper shielding can be provided.
7. Elective radiographs should be avoided.
8. For emergency treatment, necessary radiographs should be limited to the areas in question.
9. Try to minimize errors and retakes.
10. Use of E-speed or Ekta plus speed film if using analog radiography: the faster the film, the less radiation exposure to the patient.
11. Switching to digital radiography (decreases the dose about 47% for full mouth series, and about 17% for panoramic).
12. Use of thyroid shields.
13. Use of lead aprons to cover the abdominal and pelvic areas.
14. MAXTRAY high beam energy to deliver a high quality diagnostic X-ray beam in the shortest possible time.
15. Use of a long rectangular cone for collimation.
16. Lesser mA setting on CBCT to decrease dose.
17. Limitation of the field of view (FOV) on CBCT as indicated to give the necessary information for treatment planning without exposing unnecessary structures (example: narrowing the FOV for the open scan for TMJ) to include just the TMJ structures, or limited maxillary or mandibular views for implant treatment planning).

As can be noted, most of these recommendations are an application of the ALARA rule and are the same precautions that should be taken for any patient imaged radiographically. The first five precautions are specific to the pregnant or possibly pregnant patient to avoid exposure of the abdomen which contains the greatest amount of potential dose. Radiologic examinations should be performed only when necessary, and, as with any drug or intervention in pregnancy - the dose used for the examination should be kept as low as reasonably achievable.

Conclusion

The estimated fetal doses from typical radiographic examinations lend support to the conclusion that fetal risks are minimal and, therefore, radiologic examinations that may provide significant diagnostic information should not be withheld from pregnant women.

This is the position advocated by the International Commission on Radiation Protection, American College of Radiology, American College of Obstetrics and Gynecology. Nevertheless, to say, any potentially harmful factors that may affect the unborn child should be avoided, especially during the first trimester, and the As Low As Reasonably Achievable (ALARA) concept should be used as well with all other patients.

References

• Hall E: Radiobiology for the Radiologist, 5th ed. 2000, Lippencott Williams & Wilkins, Philadelphia, PA.

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