

Unsuspected Pregnancy During Bone Scintigraphy

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Despite careful screening efforts to avoid it, nuclear medicine studies are unintentionally performed on pregnant patients (1-4). Three-phase bone scanning is a common procedure performed in women of child-bearing age. Unsuspected pregnancies have been discovered on the flow and early views of the pelvis (1-4). We present a case of a pregnant girl, aged 15, who had a bone scan. We explain how this occurred and how we plan to prevent a recurrence. Dosimetry for the fetus (3,7) also is considered.

CASE HISTORY

A 15-yr old white female was referred for a three-phase bone scan (Fig. 1) to evaluate low back and right hip pain. She had a mild scoliosis and had sustained a pathologic fracture of a unicameral bone cyst of the right subtrochanteric femur two years previously. Prior to the injection, she denied being pregnant to the technologist. As is customary in this division, the images were reviewed by the radiologist upon completion of the scan. The radiologist recognized the gravid uterus on the flow (Fig. 1) and early (Fig. 2) images and then questioned the patient privately regarding the possibility of pregnancy. By dates she was at least 10-12 wk. pregnant. Pregnancy was verified by an elevated serum human chorionic gonadotropin (HCG) level. Ultrasonography performed 1 wk later revealed an 18-wk gestation with the placenta on the low left antero-lateral uterine wall, as seen on the nuclear medicine study (Fig. 3).

For personal reasons unrelated to fetal radiation exposure, the patient elected to terminate the pregnancy.

In this case, the technologist performed his/her duty correctly by asking the patient if she might be pregnant prior to injecting the isotope. The patient's denial has two likely explanations: (1) she did not fully understand her condition and (2) she was afraid to acknowledge her possible pregnancy in front of her mother.

PREVENTION

Nuclear medicine technologists must remember to ask *all* women of child-bearing years (those between the ages of 10

and 50) about the possibility of pregnancy. The technologist should record this information on the requisition. The technologist must be careful to communicate fully and not be influenced by personal prejudice or supposition to exclude teenagers, single, or older women. Young girls may be reluctant to acknowledge sexual activity. Patients who are accompanied by a friend or parent, as in the case presented here, should be handled discretely and questioned privately regarding sexual activity and the possibility of pregnancy.

Signs advising the patient to inform the technologist about the possibility of pregnancy need to be posted throughout the department. These signs should be in the reception and waiting areas where patients have the opportunity to read them prior to their study. The signs should also be posted in the injection room and camera room where patients are likely to be injected.

In regions having a significant non-English speaking patient population, signs should be in all the appropriate languages. In these cases, the technologist should point to the signs to be sure that the patient understands the question. If the technologist doubts the patient's comprehension, a translator should be sought to confirm a negative or positive response.

If the question of pregnancy remains unresolved after taking the patient's sexual and menstrual history, a confirmatory blood pregnancy test (beta HCG) should be obtained prior to radiopharmaceutical administration.

The responsibility for the administration of radiopharmaceuticals ultimately belongs to the nuclear medicine division. Technologists should not assume that the referring physician has excluded pregnancy before ordering the study.

RECOGNITION

If all such precautions fail, the astute technologist will differentiate between normal uterine blush (Fig. 4) (4) and the "doughnut" appearance of the pregnant uterus (1-3). The uterus is a highly vascular organ located superior to the urinary bladder and appears only during the angiographic and blood-pool phases of a bone scan. Uterine activity disappears by the delayed images. The gravid uterus, in contrast to the menstruating uterus, appears more intensely hyperemic, larger, and may have a photopenic center. If pregnancy is

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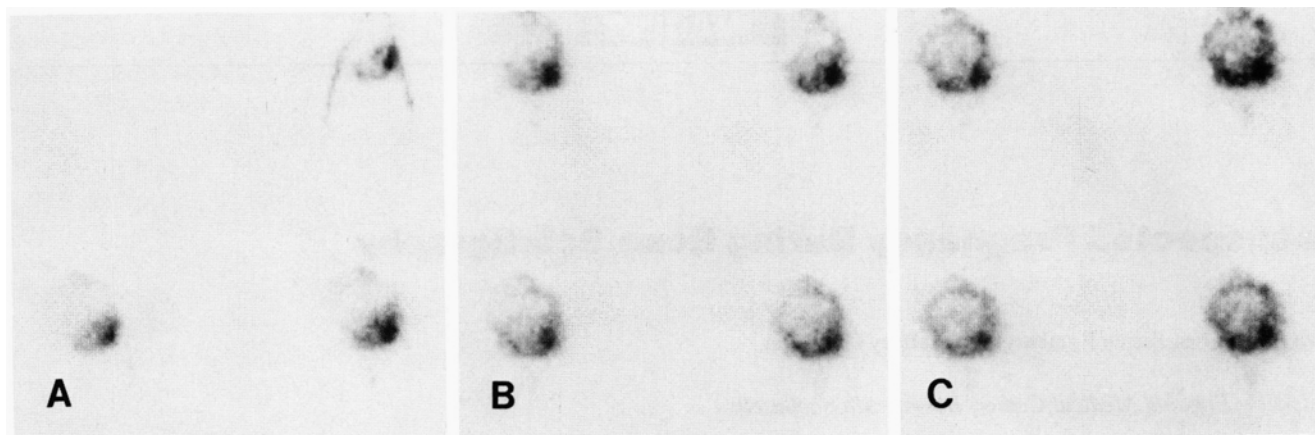


FIG. 1. (A–C) Sequential 5-sec anterior flow images of the pelvic region reveal a focal crescentic region of markedly increased flow in the left pelvis, representing the placenta. Over time a well-defined circumferential vascular pattern develops, representing the uterus.

suspected, the technologist should inform the nuclear medicine physician at once.

If pregnancy is discovered, measures can be taken to decrease the radiation dose to the fetus. The patient should be well hydrated and encouraged to void frequently. The primary radiation exposure to the fetus is from bladder activity. Further radiographic work-up, such as gallium-67-citrate scanning (1) or x-ray films, should be postponed. The referring physician should be notified promptly.

DISCUSSION

Despite careful preventive measures, some pregnant patients will be injected with radioisotopes. Pregnant teenagers are particularly at risk. Although pregnancy rates and birth rates among teenage women have declined in recent years, teenage pregnancy is a frequent occurrence (5,6). Approximately 8% of all teens and 18% of sexually active teens aged 15–19 become pregnant each year (5). Two of three reports (1–3) describing incidental pregnancy depicted by three-phase bone scanning were in this age group: (a) a 15-yr-old with a 8-wk gestation (2) and (b) a 16-yr-old with an 18-wk gestation (3). The third case was a 21-yr-old with a 16-wk gestation (1).

DOSIMETRY

After the injection of a soluble form of isotope, the uterine wall clears rapidly with an effective half-time of 12 min. The major source of fetal exposure is from the urinary bladder. Dosimetry has been calculated as 9.7 mrad/mCi to the 18-wk fetus (3). This exposure can be decreased by hydration and frequent voiding.

The 1977 National Committee on Radiation Protection and Measurements (NCRP) Report 54 (7) considers the risk of the unborn child developing an abnormality negligible at a dose ≤ 5 rads. The risk of abnormality increases significantly only at doses >15 rads. Therefore, the administration of a diagnostic radiopharmaceutical is not in itself justification for terminating the pregnancy.

CONCLUSION

Although the risk to the fetus from a diagnostic radio-nuclide study is very small, nuclear medicine personnel should strive to avoid administering radioactivity to pregnant women. Careful measures should be employed consistently to uncover pregnancy prior to radiopharmaceutical administra-

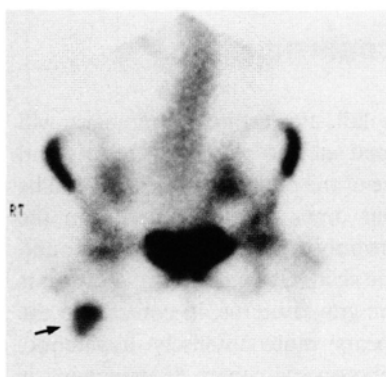


FIG. 2. Early view at 5 min postinjection demonstrating that the hyperemic uterine wall occupies the entire pelvis. The photopenic center represents the amniotic sac and fetus. Femoral bone cyst (arrow).

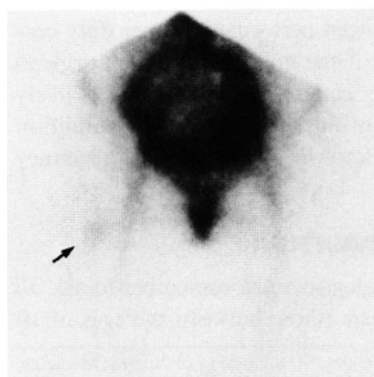


FIG. 3. Delayed anterior view shows increased uptake in the bone cyst (arrow) and questionable uptake in the region of the placenta.

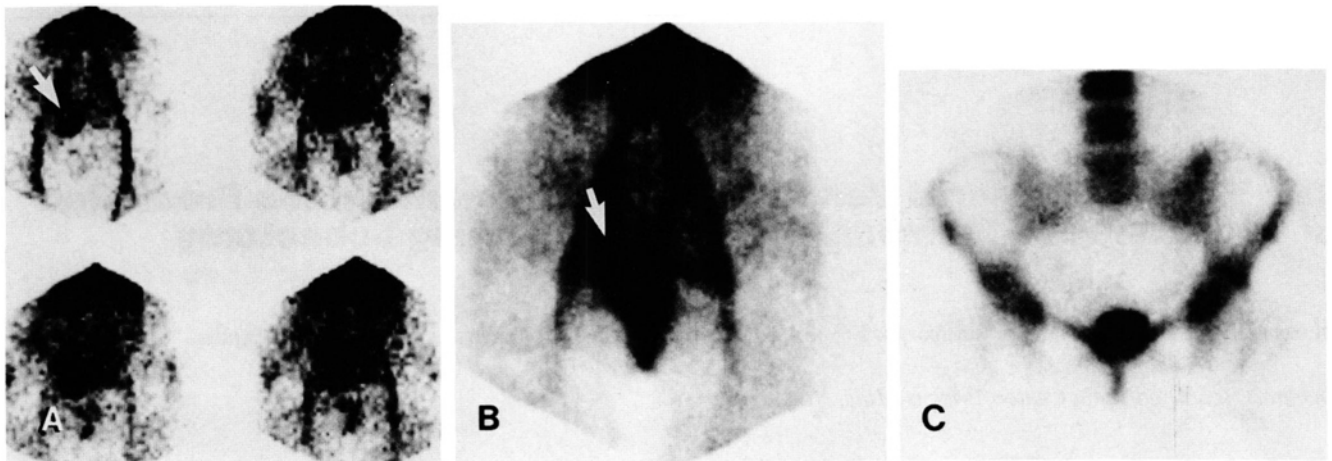


FIG. 4. (A) Sequential 5-sec anterior flow and (B) early (5-min) images of the pelvic region demonstrate the blush of a normal-sized uterus (arrow). (C) Delayed view.

tion. The teenage population is particularly vulnerable and demands special attention.

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REFERENCES

1. Palestro CJ, Malat J, Collica CJ, et al. Incidental diagnosis of pregnancy on bone and gallium scintigraphy. *J Nucl Med* 1986;27:370-372.
2. Mandell GA, Harcke HT. Pelvic "doughnut." Sign of incidental pregnancy on bone scintigraphy. *Clin Nucl Med* 1987;12:116-117.
3. Hedrick WR, DiSimone RN, Wolf BH, et al. Absorbed dose to the fetus during bone scintigraphy. *Radiology* 1988;168:245-248.
4. Mandell GA, Harcke HT, Sharkey C, et al. Uterine blush in multiphase bone imaging. *J Nucl Med* 1986;27:51-55.
5. Maciak BJ, Spitz AM, Strauss LT, et al. Pregnancy and birth rates among sexually experienced US teenagers, 1974, 1980, and 1983. *JAMA* 1987;258:2069-2071.
6. Hutchins Jr. FL, Kendall N, Rubino J. Experience with teenage pregnancy. *Obstet Gynecol* 1979;54:1-5.
7. NCRP Report No. 54. *Medical radiation exposure of pregnant and potentially pregnant women*. Bethesda, MD: National Council on Radiation Protection and Measurements; 1977:11.