Annals of Nuclear Medicine Vol. 17, No. 8, 685–687, 2003

Uterine doughnut in early proliferating phase: Potential pitfall in gastrointestinal bleeding studies

Ozgur KARACALIOGLU, Seyfettin ILGAN, Nuri ARSLAN and Mehmet OZGUVEN

Department of Nuclear Medicine, Gülhane Military Medical Academy and Medical Faculty, Ankara, Turkey

A 41-year-old woman with rectal bleeding was referred to our department for gastrointestinal (GI) bleeding study. She was in early post-menstrual period and had stable vital signs. A GI bleeding study with Tc-99m SC revealed uterine blush in the pelvis. The shape of activity and quick fading excluded a GI bleeding. To rule out an intermittent bleeding, patient underwent a second bleeding study with Tc-99m RBC. Serial images showed uterine "doughnut" in the pelvis. The activity neither changed in shape nor showed distal movement with time excluding a GI hemorrhage. Uterus in early proliferating phase could be a potential pitfall in GI bleeding studies.

Key words: Tc-99m, uterus, scintigraphy

CASE REPORT

GASTROINTESTINAL (GI) bleeding studies with Tc-99m labeled sulphur colloid (SC) and red blood cell (RBC) were performed as part of a diagnostic workup of a 41-year-old woman who was referred for suspected Gl bleeding which lasts over a month. No active bleeding site was detected during the colonoscopy.

The patient was in early proliferative phase (day 4) of her menstrual cycle and had stable vital signs at the time of Tc-99m SC study. Angiographic phase of the Tc-99m SC study demonstrated a well-defined radionuclide blush (a focal supravesical collection of radionuclide) within the pelvis (Fig. 1A) with persistent hyperemia in the blood-pool image (Fig. 1B). Small central hypoactivity was also noted on blood pool image. Activity diminished dramatically at 15th minutes obviously due to rapid clearance of the radiopharmaceutical from the circulation by the reticuloendothelial system (Fig. 1C). The doughnut shape of activity and quick fading by 15 minutes excluded GI bleeding.

Forty-eight hours after the completion of the Tc-99m SC study, the patient underwent a second bleeding study with Tc-99m tagged red blood cell (RBC) by using *in vivo* method to rule out potential intermittent GI bleeding. The images at 1 and 4 hr revealed a large radioactive pelvic blush with a photopenic center so-called "doughnut" adjacent to the bladder (Fig. 2a–b). Increased accumulation of the labeled erythrocytes in the pelvis persisted in the late planar images recorded sequentially on next day. Positional change of activity on serial images due to filling of bladder implied that activity belongs to uterus (Fig. 2c–d). Constant doughnut shape of activity and lack of distal movement excluded GI bleeding. Upon completion of the GI bleeding studies, she underwent pelvic ultrasonography and gynecologic examination, which were reported to be normal except antevert position of uterus.

DISCUSSION

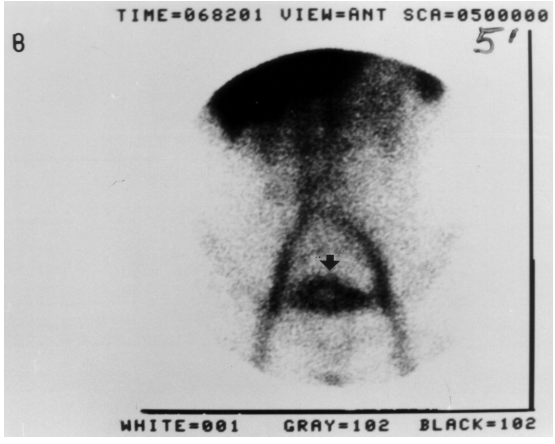
The uterine blush has been reported to occur in all phases of the menstrual cycle on multiphase bone scintigraphy in postmenarchial females.[1] Although the exact mechanism is unclear, the increased accumulation of the imaging agent in early phase of the study in normal uterus probably represents a combination of edema and hyperemia of the uterus. Camele et al. reported the appearance of the ovariuterine venous plexus on a Tc-99m erythrocyte bleeding study in a young woman nearing menses, and they suggested that engorgement of the pelvic vasculature associated with the menstrual cycle may account for

Received March 24, 2003, revision accepted August 14, 2003.

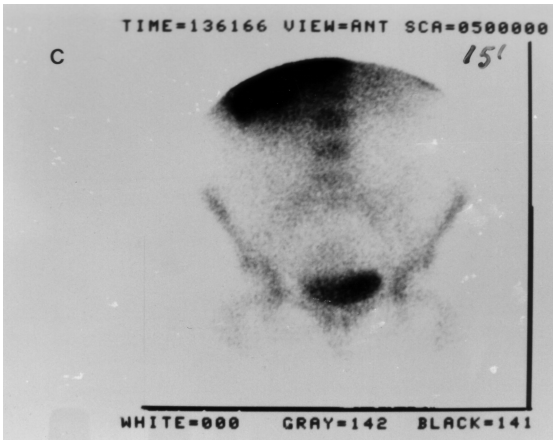
For reprint contact: Ozgur Karacalioglu, M.D., Gülhane Military Medical Academy and Medical Faculty, Department of Nuclear Medicine, 06018 Etlik-Ankara, TURKEY.

E-mail: aokaracali@yahoo.com

A



B



C

Fig. 1 Anterior blood flow images (A) of the abdomen (1 second/frame) after the injection of 370 MBq (10 mCi) of Tc-99m SC show progressive accumulation of the radiopharmaceutical in the pelvic region so called uterine blush (*arrows*). Pelvic accumulation of the radiopharmaceutical in the blood pool image (B) obtained at 5 minutes is no longer visualized in delayed image (C) taken at 15 minutes. Note small central hypoactivity on blood pool image probably due to endometrial cavity.

the visualization of these structures.[2] By reviewing the literature, it can be concluded that uterine blush occurring during the early (i.e., vascular) phase of studies performed with different radiopharmaceuticals almost always represents a normal physiologic phenomenon, and should not be misinterpreted as indicative of a GI bleeding.[3–5] However, it should be remembered that, uterine uptake of Tc-99m labeled agents may also be indicative of some pathological processes such as adenomyosis[6] or leiomyoma[7] rarely.

In our case, doughnut appearance on both scans can be attributed to increased vascularity and perfusion of the uterus due to endometrial gland proliferation under the influence of estrogen, and photopenic center caused by endometrial cavity. Antevert position of uterus might augment hypoactive appearance of endometrial cavity by causing superposition of endometrial cavity on anterior images. Pelvic doughnut sign was reported in pregnant women or in early post-partum uterus.[8–11]

Uterine blush and uterine doughnut have been described

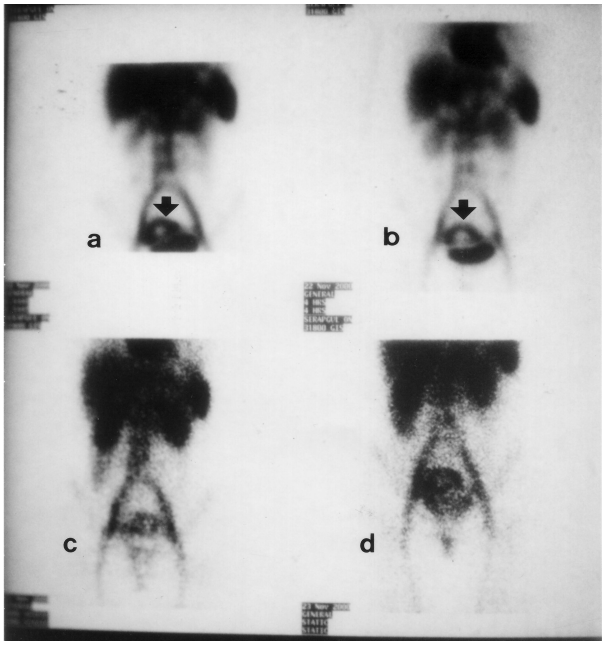


Fig. 2 Anterior abdominal and pelvic images at 1 (a) and 4-hour (b) reveal a doughnut shaped abnormal accumulation of radiotracer within the pelvis. Increased accumulation of the labeled erythrocytes in the pelvis persisted in the late planar images recorded sequentially on next day (c–d). Positional change of activity on serial images due to filling of bladder implied that activity belongs to uterus.

in normal uterus and various uterine pathologies with different radiopharmaceuticals. These appearances might be potential false-positive causes for the diagnosis of GI bleeding. In this case report, authors present scintigraphic appearances of the normal uterus during the early proliferative phase on GI bleeding studies performed with two different radiopharmaceuticals.

REFERENCES

1. Mandell GA, Harcke HT, Sharkey C, Brooks K. Uterine Blush in Multiphase Bone Imaging. *J Nucl Med* 1986; 27: 51–55.
2. Camele RA, Bansal SK, Turbiner EH. Red blood cell gastrointestinal bleeding scintigraphy: Appearance of the left ovarian vein. *Clin Nucl Med* 1984; 9: 275.
3. Tzen KY, Yen TC. Uterine blush mimicking a hypervascular tumour in the pelvis as demonstrated by a triple-phase bone scan. *Nucl Med Commun* 1998; 19 (6): 605–607.
4. Palestro CJ, Swyer AJ, Rosen JM, Kim CK, Goldsmith SJ. The Uterine Blush on In-111 Labeled Leukocyte Scintigraphy. *Clin Nucl Med* 1991; 16: 782–783.
5. Orzel JA, Jaffers GJ. Menstruation a Hazard in Radionuclide Renal Transplant Evaluation. *Clin Nucl Med* 1986; 11: 409–410.
6. Moreno AJ, Pacheco EJ, Carpenter AL, Rodriguez AA, Turnbull GL. Adenomyosis as seen on blood flow and blood pool imaging during bone scintigraphy. *Clin Nucl Med* 1994; 19: 204–206.
7. Elgazzar AH, Mahmoud AR, Abdel-Dayem HM. Technetium-99m DTPA in uterine leiomyoma. *Clin Nucl Med* 1988; 13: 29–31.
8. Swayne LC. The Uterine Doughnut: Potential Pitfall for Technetium-99m Gastrointestinal Bleeding Study. *Clin Nucl Med* 1989; 14: 759–761.
9. Sanders JA, Lin DS, Connors JJ. A pelvic "Doughnut" sign on three-phase bone scan. *Clin Nucl Med* 1984; 9: 167–168.
10. Mandell GA, Harcke HT. Pelvic "Doughnut." Sign of Incidental Pregnancy on Bone Scintigraphy. *Clin Nucl Med* 1984; 13: 116–117.