Update on Gallium-67 Concentration in Human Breast Milk

Anne W. Greener, Patrick J. Conte, and K. David Steidley

St. Barnabas Medical Center, Livingston, New Jersey

The concentration of gallium-67 in maternal breast milk has been previously reported in four patients and was estimated to have a biological half-life of nine days. We recently had the opportunity to measure gallium in the breast milk of another postpartum patient following gallium scintigraphy and to compare this value with those previously reported. Our sample was found to have 46 nCi of gallium-67/ml/mCi injected; this was consistent with an approximate nine-day biological half-life. At least a two-week hiatus from breast feeding is recommended in order to reduce the infant whole body dose to at least 40 mRads and the skeletal dose to 70 mRads or less.

A 26-year-old gravida V, para II woman was admitted in her 28th week of gestation because of premature labor. Past obstetrical history included two previous cesarean sections and two spontaneous miscarriages. A low transverse cesarean section was performed, and a 2 lb., 15 oz., newborn was delivered. Intraoperatively, a large exophytic mass was palpated on the posterior surface of the cervix. Biopsy revealed a grade II moderately-well-differentiated keratonizing squamous cell carcinoma of the cervix. Oncology work-up included gallium scintigraphy, which was consistent with the clinical diagnosis of carcinoma of the cervix localized in the pelvis. Avid bilateral postpartum breast activity was also noted (Fig. 1).

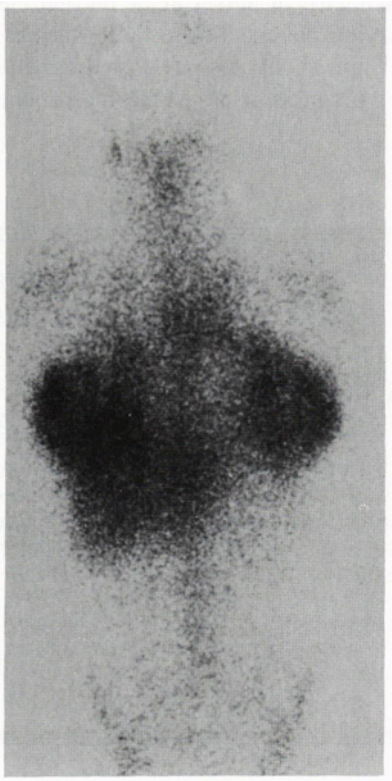

FIG. 1. Gallium scintigraphy with bilateral postpartum breast activity.

Procedure

A single 20-ml sample of milk was obtained 88 hr after the intravenous injection of 5.2 mCi of gallium-67 citrate. The radioactivity was determined in a well scintillation counter with a 1,024 channel multichannel analyzer. The analysis was done using a fourth peak of the gallium spectrum with an energy of 394 keV and an efficiency of 4.3%. Barium-133, which has emission energies of 356 keV and 284 keV, was used to obtain a counter efficiency of 30% for that energy. This sample was found to have 46 nCi of Ga-67/ml/mCi of Ga-67 citrate injected.

Concentration of Ga-67 in breast milk was previously reported in four patients (*1–4*). Table 1 lists these concentrations, along with our value; all were determined at various times following intravenous injection. Our value was consistent with the data found in the literature: an approximate nine-day biological half-life and a 24-hr concentration of 90 nCi/ml/mCi injected.

TABLE 1. Concentration of Gallium-67 in Breast Milk

Time after injection (hr)	Concentration (nCi of Ga-67/ml/mCi of Ga-67 injected)*	Reference
72	50	2
88	46	present
96†	23	1
120†	23	1
168	15	2
240	15	4
336†	3	2

*Corrected for physical decay to day sample was obtained
†Estimates

Discussion and Conclusion

Increased breast activity following a Ga-67 intravenous injection is usually noted in postpartum patients. The exact

For reprints contact: Anne W. Greener, Nuclear Medicine Section, St. Barnabas Medical Center, Old Short Hills Rd., Livingston, NJ 07039.

mechanism for the accumulation of gallium in the lactating human breast has not yet been defined. Hoffer et al. (*4*) have postulated that gallium has a strong affinity for lactoferrin, which is present in high concentrations in mammary tissue. Hayes (*5*) points out that during gestation and lactation, marked increases in lysomal enzymes occur in the mammary glands; this suggests that lysosomes may be responsible for the Ga-67 citrate concentration in breast tissue with increased excretion into the breast milk.

Early institution of breast feeding following maternal Ga-67 administration poses a radiation risk to the infant. It is imperative that technologists or nurses in the nuclear medicine department interview patients before radiopharmaceutical administration. Signs should also be posted in patient waiting areas directing pregnant or breast-feeding patients to notify the technologist. We concur with Tobin and Schneider that if a patient is breast feeding, she should be instructed to delay infant nursing for at least 14 days (*2*). With a two-week hiatus in infant nursing, the estimated infant dose is 40 mRads to the whole body and 70 mRads to the skeleton.

References

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