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LETTERS TO THE EDITOR

Radiation Safety Issues Related to Sentinel Lymph Node Biopsy using Radioactive Colloid: Commentary on "Exposure of Surgical Staff to Radiation"

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The most important prognostic factor in patients with breast cancer is the presence or absence of axillary lymph node metastasis.*(1)* Although axillary lymph node dissection (ALND) can be the most accurate method to assess axillary nodal status, it is related to significant physical and psychological morbidity such as pain, lymphedema, neuropathy, limited of motion in shoulder, etc.*(2)* In 1993, Krag et al.*(3)* performed a pilot study on a technique using gamma probe localization of sentinel lymph node (SLN) labeled with radiocolloid. They proposed that lymphoscintigraphy has a potential value in localizing SLNs. They also found that those SLNs selectively dissected using the lymphoscintigraphy appear to predict the status of the entire axillary lymph nodes. Since then, SLN biopsy (SLNB) with Tc-99m radiocolloid based lymphoscintigraphy has gained popularity as an optimal technique which provides accurate staging of axillary lymph nodes with decreased morbidity. In addition, the minimally invasive approach has increased quality of life and cost effectiveness for the management of patients with clinically negative axillary lymph nodes.*(4)* However, lymphoscintigraphy using radioactive colloid raised safety issues on radiation exposure to surgical staff, contamination of surgical equipment, and the disposal of radioactive waste. Radiation exposure to surgical staff during SLNB using radiolabeled colloid is the topic of the study by Bekis et al.*(5)* in this issue of the Journal of Breast Cancer. The study assessed the level of the radiation dose to surgical staff during surgical probe applications in 3 patients with breast cancer. Based on the measurement of radiation dose by a Geiger Mueller counter, the whole body dose to the senior surgeon was calculated well below the annual radiation dose limit (1,000 μSV/year) for a member of the public by the International Commission on Radiological Protection. They confirmed that the radiation risk to the surgical staff from SLNB with radiolabeled colloid is low and the procedure can be safely performed by the surgeons. The measurement of exposure rates for radiation by a Geiger Mueller counter seems to be easy and inexpensive. However, it could be more difficult to translate the information to conditions in the daily practice of the surgeon.*(6)* Instead, the actual measurement of radiation dose using thermoluminescent dosimeter (TLD) seems to be more suitable. Until now, studies on measurement of the radioactivity, radiation exposure, or radiation dose for lymphoscintigraphy and SLN dissection have been reported to resolve radiation safety issues.*(7-10)* All reports in the literature showed that radiation exposure from lymphoscintigraphy and SLNB to surgical staff and pathologists is very low. The surgeon's hands and abdominal wall was exposed to the most radiation. The average radiation exposure to the surgeon's abdomen ranged from 0.34 to 10 μSV (average 5.8 μSV) and the average radiation exposure to the hands ranged from 40 to 98 μSV (average 63.4 μSV). Even after accounting

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for the differences in surgical method and time, radiotracer injected, time interval between injection and surgery, the radiation exposure in all of these studies showed that the radiation exposure to the surgeon was minimal. Considering that the whole body effective dose limit per year for public members is 1 mSV (20 mSV for radiation workers), surgeons can safely perform 200 to 500 operations per year to reach the annual dose limit for public members. Therefore, personal dosimetry is not required for surgical staff although radiation safety training seems helpful for all personnel involved in the procedure. Because the highest radiation exposure recorded was during the time of injection of the radiopharmaceutical (maximal dose recorded: hand exposure 160 μV),*(10)* it is recommended to prepare and inject radiotracer by experienced nuclear medicine professionals. Since most of the radiotracer is localized in the injection site (>95%) and that the radioactivity is detected in the lymph nodes after surgery (91%),*(7,8)* it is required to keep surgical specimens in special area for appropriate time to minimize the radiation exposure to the pathologists. Keeping all the recommendations described above would maximize radiation safety from lymphoscintigraphy and SLNB to stay safely within the concept of As Low As Reasonably Achievable (ALARA).

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