

Evaluations of Occupational Exposure During Bone Scan Procedure

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Introduction: Bone scan using radioactive materials is widely used as a frequent screening test for suspected bone metastases because of its high sensitivity, availability, low cost, and ability to scan the entire skeleton. The main agent in current clinical use for bone scanning is ^{99m}Tc methylene diphosphonate (MDP). Thus, Nuclear medicine staff may receive considerable radiation dose.

Objectives: The study aimed to evaluate the radiation doses received by the nuclear medicine staff and patients during whole body bone scan procedure and to estimate the organ doses during the entire procedures.

Materials and Methods: The following study was carried out a 5 mCi of ^{99m}Tc -MDP follow intravenous injection and accumulated in bone rapidly. Anterior and posterior data acquisition achieved using MiE single head gamma camera. Radiation dose was evaluated during 19 bone scan procedure for three technologists. Calibrated Six TLD chips in enveloped in a plastic sachet (GR200) were positioned over the right hand and chest of each technologist. The study was carried out in Alnilain Diagnostic Center, Khartoum, Sudan.

Results: The mean chest and hand doses for the three adult staff were $64.4 \mu\text{Gy}$, $6.3 \mu\text{Gy}$ respectively. The staff organ doses received by the lung, bone marrow, colon and stomach were of magnitude of $0.77 \mu\text{Sv}$, and the skin dose is equal $0.032 \mu\text{Sv}$, hence only $15.4 \mu\text{Sv}$ is received by the staffs' organ what is within the acceptable 50 mSv annual organ dose limit determined by ICRP.

Table 1: Chest dose (μGy) per procedure

Mean	64.38
Median	53.59
Std. Deviation	3.363
Variance	1.131
Minimum	30.39
Maximum	171.07

Table 2: Hand dose (μGy) per procedure

Mean	6.29
Median	5.64
Std. Deviation	3.29
Variance	1.08
Minimum	3.04
Maximum	1.71

Figure 1: Comparison between hand and chest doses (micro-Gray)

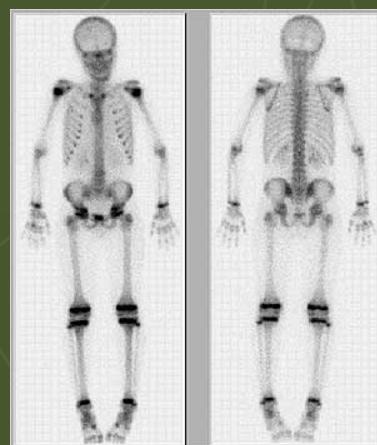
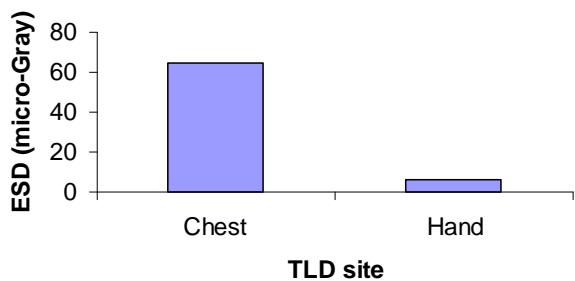


Figure 2: Bone scan procedure

Conclusions: Chest doses was higher than hand doses because of direct handling with the injected patient and leaning the patient during submitting to scanning procedure. The study recommend increasing of staff and co-patient awareness about radiation safety and wearing lead apron inside any controlled area to enhance radiation protection in Al-Nilen diagnostic center. Urgent training is highly recommended for staff for further dose reduction.