Contribution ID: **141** Type: **Poster**

ASSESSMENT OF OCCUPATIONAL EXPOSURE FROM PATIENT TREATED WITH 131I FOR THYROID CANCER

Oral administration of large doses of radioiodine 131 has been a commonly accepted procedure for treatment of benign and malignant conditions of the thyroid since 1940s [1]. Several research papers and guidelines were focused on the external dose rate from patient treated by radioiodine 131 in discussing the release criteria from hospital [2] or assessing the related public or occupational exposures [3,4]. The goal of the present work is to provide a simple equation to assess the medical staff's occupational exposure nearby a radioiodine 131 administrated patient.

A randomized sample of 86 patients administrated with 131I for thyroid radioiodine therapy at AL-BAYROUNI University Hospital was monitored. The patients'administered activities ranged from 3060 to 5650 MBq. A calibrated universal survey meter type RADOS-200 was used to measure the external radiation dose rate from the administrated patients. The Measurements were effectuated post radioiodine dose administration at a distance of 1 meter from the effective point of measurement and standing point of the patient at the thorax level. The patients sample was divided into two groups according to two administrated activity ranges. The patients'age, height, and weight were also recorded. Tables 1 and 2 represent the description of the patient groups and the related anthropometric measurements.

The mean values of the measured patient external radiation dose rates and theirs normalised dose rate values in terms of administered activity for patient groups are presented in Table 3. The calculated mean values was within the range of 50.3-145 and 75.53-209 μSv.h-1 respectively. The mean patient external dose rate in Group B was relatively higher by ˜18% than in Group A since the administrated activity in Group B was higher than in Group A, however, the differences in of the external dose rate between female and male was insignificance.

The exposure from an administrated patient to nearby persons is related primarily to the distance from him, to the exposure duration, and to the administered radioiodine activity. The maximum external dose rate measured from the monitored patient sample was 209 μSv.h-1 and the mean normalized value of the external dose rate was 0.031±006 μSv.h-1.Mbq-1 with a coefficient of variation of 18.7%. Therefore, by applying the inverse square law, the average worker's effective dose nearby a patient administrated with an activity A (Mbq) of 131I at a distance d (m) and for a time duration of T (Hour) can be estimated by the following equation:

$E(\mu Sv)=0.031 T 1/d\hat{}2 *A$

For of a realistic exposure scenario simulating the presence nearby an administrated patient with 3700 Mbq of radioiodine 131I for 5 minutes at a distance of 50 cm and for 10 minutes at a distance of 1 meter, the estimated worker's effective dose will be 57.35 μSv. As the average annual monitored effective dose for exposed workers in a nuclear medicine is ranged from 3 to 5 mSv [5], the proposed equation could be a useful tool to estimate instantly the medical staff's occupational or emergency exposure and consequently to maintain the conformity with radiation protection principles.

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Session Classification: Session 8. Occupational radiation protection in medicine

Track Classification: 4. Occupational radiation protection in medicine