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Feasibility of using a thyroid probe for ^{131}I intake surveillance of nuclear medicine workers

This research, propose a monitoring procedure of ^{131}I intake of nuclear medicine workers using the thyroid probe of the Nuclear Medicine Department. The Thyroid Counter used is a gamma probe, equipped with a lead shielded NaI(Tl) scintillation detector of 30x30, also was studied the gamma camera Phillips Forte with NaI(Tl) 3/8" pinhole collimator-5mm. The efficiency calibration was performed with a thyroid phantom, simulating the adult thyroid anatomical shape and volume, filled with radioactive solution of known activity of ^{131}I (uncertain activities of 2.24%). The intake and the effective dose estimation were made following the steps suggested in the IDEAS - General Guidelines for the Estimation of the Committed Effective Dose from Incorporation Monitoring Data. The values determined for the efficiency (E) and for the Minimum Detectable Amount (MDA) for probe were of $3.76 \times 10^{-3} \pm 1.15 \times 10^{-4}$ CPS/Bq and 46 Bq for ^{131}I (364 keV), respectively. Meanwhile, for the gamma camera with pinhole were significant higher ($E = 1,96 \times 10^{-4} \pm 9,3 \times 10^{-6}$ CPS/Bq and MDA=85 Bq). The probe system is capable to detect dose as low as 0,004mSv at 24h and 0,02mSv at 2h. A worker monitoring ^{131}I intakes procedure was proposed and established, based on routine screening 2 and 24 hours after to finish "hot lab", "administration routine" of ^{131}I dose to patient, contaminated wastes manipulations, or in case of detected or suspected radionuclide intake. If the contamination is positive, confirmatory monitoring should be developed using the "probe"(and the gamma camera if it is needed for spatial thyroids uptake distribution). The committed equivalent thyroid dose will be evaluated taking into account the real thyroid mass, using the up-taking mass correlated with ultrasound and the real bio-kinetic behavior. The use of probe, for this purpose, produces a significant reduction of uncertain caused by the mass of thyroid, effective half-time and the time of intake. Also, it includes the possibility to block the thyroid uptake during the first 4h of intake, with the reduction of the Committed Effective Dose and Committed Equivalent Dose of the worker.

Index Terms: radiation worker's surveillance, internal contamination, I-131 intake, nuclear medicine workers

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