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DOSIMETRIC MEASUREMENTS USING ^{124}I -PET DURING ^{131}I THERAPY OF
HYPERTHYROIDISM

Summary

^{124}I measurements has been performed in 12 patients with toxic multinodular goiter, 2 with toxic adenoma, and 1 with Graves disease. ^{131}I therapeutic dosis and $30 < 196 > 40$ MBq ^{124}I were administered orally, simultaneously. PET images (10 minutes transmission and 75000 coincidental events in emission phase) were acquired using a whole-body PET-scanner (GE Advance). In each patient, $4 < 196 > 5$ scans were performed in two weeks, starting 24 hours after application. In all patients scintillation probe measurements of ^{131}I kinetics were performed simultaneously. Uptake values and effective half-lives of ^{131}I and ^{124}I showed mean deviations of 1.8% and 4 hours, respectively. Correlation coefficient was: 0.99 for uptake and 0.88 for effective half-life. Additional evaluation of regional functionally autonomous and paranodular tissue revealed considerable difference both in ^{124}I specific uptake (nodules: $12.6 < 196 > 29.3$ KBq/ml/MBq, rest thyroid tissue: $2.0 < 196 > 8.3$ KBq/ml/MBq) and in effective half-lives (nodules: $93 < 196 > 193$ hours, rest thyroid tissue $107 < 196 > 162$ hours) which concerned different nodules within the same thyroid, as well. Results indicate that ^{124}I PET enables a precise measurement of the regional radioiodine distribution and kinetics in functionally active thyroid tissue, necessary for the accurate calculation of the target dose to be delivered by radioiodine therapy.

Key words: positron emission tomography, ^{124}I , thyroid, hyperthyroidism, radioiodine therapy.