

I. Thyroid and Acces. Thyroid

Dynamic Analysis of Thyroid Function Using ^{99m}Tc

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Dynamic analysis of thyroid function using ^{99m}Tc was studied for the purpose of detection of thyroid carcinoma in an early stage. The scintillation camera with pinhole collimeter was connected with a small general purpose computer. Thyroid scintillation photo was recorded on magnetic tape every 10 to 20 seconds interval immediately after intra-venous administration of 2 to 3 mc. of ^{99m}Tc through cubital vein. By flagging regions of interest, two areas of an equal size in the thyroid were chosen, one including center of nodule, the other, maximal point of uptake within the thyroid. The counts of both areas were continuously printed and their fluctuation was also analysed.

1. Dissociation time: Dissociation of uptake curves of both areas was found after 100 seconds following ^{99m}Tc injection in benign solid nodule cases, whereas it was within 40 seconds in benign cystic nodule. However, dissociation of two uptake

curves of malignant nodules cases was recorded between 40 and 100 seconds.

The observation of Dissociation time is adequate in 10 seconds interval record.

2. Consuming time to reach the maximal uptake level of the curve of maximal point area in histologically known 145 cases was measured and analysed.

In observation record for 18 minutes, out of 18 malignant nodule cases, in which 3 occult carcinomas were included, consuming time of 14 cases were recorded beyond 14 minutes. In 127 cases of non-malignant cases, consuming time of 80 cases were recorded within 13 minutes. Particularly, it was shorter in chronic thyroiditis case. We expect above-mentioned analyses are of an effective screening method for T1 type of thyroid carcinoma and chronic thyroiditis.

Functional Imaging of the Thyroid with ^{99m}Tc -Pertechnetate Appraisal for a Parameter of Initial Slope

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Functional imaging of the thyroid using a new parameter "Initial Slope" was investigated. Following intravenous injection of 5 mCi of ^{99m}Tc -pertechnetate, sequential data were collected in a mode with 64×64 matrix using a gamma camera and an on-line computer (DAP-5000 N). For all the time-activity curves on the 64×64 elements initial slope was calculated according to following formula and displayed such that brightness is proportional to calculated values for T 1/2.

$$T1/2 = 3.51 / \sum_{t=0.5}^2 1/n [C_{10}/(C_{10} - C_t)]$$

where, C_t represents count rates at t minutes after injection.

Constructed functional images showed special regional thyroid function in terms of T 1/2 of initial slope. Averaged values for T 1/2 in thyroid area, which was automatically printed out, ranged 0.4 to 1.1 minutes in euthyroidism, increasing in hyperthyroidism, decreasing in hypothyroidism. In addition, it showed good responses to T_3 suppression and TSH stimulation. There was a good correlation between averaged T 1/2 and ^{131}I uptake ($r=0.857$, $P<0.005$).