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Graphical analysis of ^{99m}Tc thyroid scintigraphy

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A new non-invasive simple method for quantitative evaluation of thyroid was presented using graphical analysis of the transfer process of technetium-99m pertechnetate (^{99m}Tc) from the blood to thyroid. Thirty subjects were studied. After a bolus injection of 111 MBq of ^{99m}Tc, the data were recorded on a 128×128 matrix as 60 frames of 1.5-second duration. ROIs were placed over the aortic arch and bilateral thyroid lobes. The activity of the aorta was monitored instead of the arterial activity. Graphical analysis by plotting $B(t)/A(t)$ versus $\int_0^t A(\tau)d\tau/A(t)$ gave a straight line within the first 30 seconds in all subjects. The slope of the line was the unidirectional influx rate of ^{99m}Tc (k_u). Thyroid perfusion index (TPI) was calculated to standardize where the ratio of $ROI_{thyroid}$ size to ROI_{aorta} size was set as 10. K_u and TPI showed good correlation with ^{99m}Tc thyroid uptake. Hyperthyroid patients showed high values of k_u and TPI. Considering that these indices were determined at the first pass of ^{99m}Tc, this method may be helpful especially in the evaluation of thyroid perfusion.

Key words: graphical analysis, Patlak plot, thyroid, technetium-99m pertechnetate, scintigraphy