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