Studies of the Intrarenal Distribution of Blood Flow with ^{133}Xenon

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Measurement of the renal blood flow using inert gas ^{133}Xe was carried out in patients with hypertension and chronic renal diseases and the results obtained from the ^{133}Xe wash-out technique were compared with those from the dye-dilution method.

The wash-out curves of ^{133}Xe recorded for over 45 minutes were graphically resolved in 4 components, while only 3 components were recognized in the wash-out curves recorded for 30 minutes. The mean values of flow rates and ratios in component I and III calculated from the curves for 30 minutes were compatible with those of component I and IV from the curves for 45 minutes, respectively. The mean value of component II from the curves for 30 minutes was almost the same as that of the average of the means of component II and III from the curves for 45 minutes. Statistically significant correlations were observed between the corresponding components from both observations, except flow rates between component II of the 30 minutes observation and the average of component II and III of the 45 minutes observation. These results suggested that component I, II and III of the 30 minutes observation probably represent the cortical, medullary (including outer and inner medulla) and extrarenal blood flow respectively.

Comparing the graphical and numerical methods, better reproducibility was observed in the graphical analysis, although a significant correlation was found in component I between both techniques.

Correlations of the flow ratios of the cortex and the medulla between the measurements with the ^{133}Xe wash-out method and dye-dilution methods descried by Takeuchi and coworkers were statistically significant, while the values obtained from the dye-dilution method according to the description of Reubi et al. were not correlated to those from the ^{133}Xe wash-out method.

In the patients with impaired renal function, flow rate of the cortex (component I) was decreased and that of the medulla (component II) was unchanged, consequently the ratio of the cortical flow was decreased and that of the medullary flow was increased. This result was the same as that of the previous report from our laboratory using dye-dilution method.

Renal Cortex Blood Flow Measured by the ^{85}Kr and Semiconductor β-Detector

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Continuous recording of the radioactivity of β-ray of ^{85}Kr introduced into the renal artery was done by the use of the semiconductor radialion detector which was placed just over the surface of the kidney for the measurement of cortical blood flow by clearance method. In dog experiments, the blood flow obtained by this method corresponded well with the flow value calculated from the first component of the clearance curve of the external γ-metry, which is accepted as the cortical flow. In the