Clinical Observation of Impulse Response Curve of Kidney on Radio-hippuran and Radio-chelate Administration.

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Construction of a functional imaging of the kidney by peripheral introduction of the radio-hippuran and/or the radiochelate become prevailing. However, interpretation of derived parameters especially concerning the intrarenal transit process of these tracer is actually at a loss. So it is necessary to define the process precisely, e.g., by examining the impulse response of this dynamic system.

By introducing a bolus of radio-hippuran and/or radio-chelate into a renal artery, subsequent transit process of these tracers was observed by scintillation camera. On inspecting a battery of time-activity curves selected from various part of the kidney, any difference of time course between these tracers were found, indicating that these were tagged tubular fluid preferentially down and up again along the course of nephrons. On loading osmotic diuresis, spread of frequency distribution function of renal tubular transit times became shortened with the evidence of decentralization of the intrarenal blood flow distribution according to the radioxenon washout study simultaneously done. In patients with essential hypertension with definite centralization of the intrarenal blood flow distribution revealed significant shortening of the spread of the renal tubular transit times. Present investigation offered a good insight for intrarenal physiology concerning intrarenal blood flow as well as urine flow, those of which invariably related each other.

Distribution of $^{99m}$Tc-DMSA, $^{203}$Hg-chlormerodrin and $^{203}$Hg-acetate in the kidneys

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This study was performed to compare $^{99m}$Tc-DMSA ($^{99m}$Tc-dimercaptosuccinic acid) with two radioactive mercuric compounds ($^{203}$Hg-chlormerodrin and $^{203}$Hg-acetate). Their distributions in the kidneys were investigated after intravenous administration of these agents to rats. These rats were sacrificed at two hours after administration, and kidneys were frozen in n-hexane ($-70^\circ$C) cooled with dryiceacetone. After that, these frozen kidneys were cut to the this section (10 $\mu$m) in the cryostat ($-20^\circ$C). First slice of these sections was then placed on X-ray film and this film was developed after exposure of several days. On the other hand, next slice of these sections was then stained using the hematoxylin and eosin. From following these autoradiogram and H.E. stained
slice, the following results were obtained. Distributions of \(^{203}\text{Hg}\)-chloromerodrin and \(^{203}\text{Hg}\)-acetate in the kidneys were very similar and these agents were localized on renal cortex, especially on medullary rays. But the deposition of \(^{99m}\text{Tc}\)-DMSA was restricted within renal cortex except medullary rays.

**Chemical and Biological Studies on \(^{99m}\text{Tc}\)-DMSA Complex**

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\(^{99m}\text{Tc}\)-dimercaptosuccinate (\(^{99m}\text{Tc}\)-CMS) complex was prepared by electrochemical, electrolysis, SnCl\(_2\) and NaBH\(_4\)-HCl methods. In all methods, less than 0.1\% of free \(^{99m}\text{Tc}\)O\(_4\) was detected in the original preparation. The electrophoretic and paperchromatographic patterns of \(^{99m}\text{Tc}\)-DMSA was separated into two peaks. One peak was detected at nearly same spot as free DMS while the other peak remained at the origin. Kidney uptake was due principally to the \(^{99m}\text{Tc}\)-DMSA complex which remained at the origin during the separation procedure. There were significant differences in organ distributions depending upon the methods and conditions of preparation. The highest renal concentration was achieved with SnCl\(_2\) method at pH=2 (60\% dose/g-organ), whereas, the lowest was with electrochemical method at pH=10 (1.9\% dose/g-organ), at 3 hr. after injection into mice. 

The \(^{99m}\text{Tc}\)-DMSA complex prepared by the electrochemical method at pH=10 was accumulated significantly by bone, which might be useful for bone scanning.

**Clinical Evaluation of Renal Imaging by \(^{99m}\text{Tc}\)-DMSA**

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\(^{203}\text{Hg}\)-Neohydrin was commonly in use as renal imaging agent. However, \(^{203}\text{Hg}\)-Neohydrin has drawbacks such as high exposure dose to the patient. \(^{99m}\text{Tc}\)-DMSA study on clinical renal imaging was performed. Sixty three cases consisted of 33 males and 30 females from 12 to 89 years old (mean 57.9 y. o. were evaluated by this new radiopharmaceutical.

Pho/Gamma HP with parallel high resolution