

# The Clinical Evaluation of the Renal Function Test by the Radioisotope Human Serum Albumin and Radioisotope Hippuran—Analysis of the A-Segment in Radioisotope Renogram at the Diseased Kidney—

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We obtained interesting results of the experiments in which we try to analyze the A-segment in RI-renogram which was still unsolved.

Method of experiments:

Though RI-renogram recorded by means of the surface counting method using only hippuran, presently we analyzed the A-segment of RI-renogram by using both hippuran and RISA.

The RISA-hippuran renogram was recorded by the separated two of the same counts of RISA and hippuran. Therefore, the renogram obtained is consisted of RISA-renogram and hippuran-renogram, in which the pattern recorded before hippuran injection indicates the RISA-renogram.

We compared the a-segment in RISA renogram with the A-segment in hippuran renogram.

Results:

1) It is apparently by our method that the A-segment is consisted of vascular segment and renal secretion phase, though the A-segment has been recognized to indicate vascular segment.

We consider that the upper part of value by drawing that of the a-segment in RISA renogram from that of the A-segment in hippuran renogram should be involved in renal secretion phase, since the lower part of value in the A-segment is equal to that of the a-segment in RISA renogram, vascular segment.

2) It was proved that the value of the A-segment/the a-segment ratio in a good functioning kidney was larger than 1.3 and becomes near to 1.0 in disfunctioning kidney.

In other words the value of the A-segment/the a-segment ratio was found to be in a certain correlation with the effective renal plasma flow (the value of the PAH clearance).

## Use of $^{131}\text{I}$ -Hippuran and $^{197}\text{Hg}$ -Neohydrin for the Renal Function Test

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There are few ways in the quantitative analysis of renogram with a definite examination because of its own complexity. A small autofluoroscope with 30 (58mm thick, 12mm square) sodium iodide crystals was used to study the quantitative analysis of renal func-

tion in normal subjects and various renal diseases. They were injected intravenously with  $^{197}\text{Hg}$ -Neohydrin  $100\mu\text{Ci}$ ,  $^{131}\text{I}$ -Hippuran  $50\mu\text{Ci}$  and  $^{131}\text{I}$ -RISA  $50\mu\text{Ci}$  in succession, the radioactivity was observed every 40 seconds compartmentally (cortex, medulla and pelvis).

The terms cortex, medulla and pelvis are not meant to be synonymous with the true anatomic compartments. In this study the right kidney was chosen mainly and the collimator was placed on the middle clavicular line of the right costal arch. In the normal subjects Neohydrin was observed at the highest radioactivity in the cortex, the second in the medulla and the third in the pelvis. The composite curve resembled closely the renal accumulation curve. The pelvis had the highest radioactivity with Hippuran and it resembled the composite total kidney activity, which resembled renogram. The medulla and cortex had the same radioactivity, but lower than the pelvis. The pelvis had also the highest radioactivity with RISA and paralleled the

composite curve. The medulla and cortex had the same radioactivity, but lower than the pelvis. Therefore, it was considered that the renogram pattern was mainly made of pelvic radioactivity and particularly of the vascular component. In the patient with chronic nephritis that had reduced renal function, all the three compartments had nearly the same radioactivity with Neohydrin, and its accumulation was very poor. The same pattern was observed both with Hippuran and RISA. Only the pelvis had a little higher radioactivity in both tests.

Thus, it may be concluded that the autoradiography was very useful in the quantitative analysis of the compartmental renal function.

### A Comparative Study between Differential Renal Function Test by Means of $^{203}\text{Hg}$ -Neohydrin and Renal Clearance

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The method and value of the differential renal function test by means of external scintillation counting method using  $^{203}\text{Hg}$ -Neohydrin were already read at the 4th General Meeting of the Japanese Association of Nuclear Medicine (1964).

This paper is to report, the results of the renal uptake rate and split renal clearance (CPAH) measured on 32 patients, 49 kidneys (contained 17 remaining kidneys). Five  $\mu\text{Ci}$  of  $^{203}\text{Hg}$ -Neohydrin was administered intravenously and its renal accumulation was detected an hour after injection. The patients were placed in prone position, and the renal uptake counts were measured on their posterior axillary lines. The renal uptake of  $^{203}\text{Hg}$ -Neohydrin was expressed in percentage of

the administered dose, which was counted 10cm apart from the top of the collimator. Ureteral catheterism was performed carefully, to avoid leakage of urine.

There was a higher correlation between the renal uptake rate and CPAH in 17 remaining kidneys than that of the 32 kidneys employed ureteral catheterism.

Though there were some difficulties in the counting uptake rate because of anatomical and radiological reasons, but it was thought that this method might be reliable as well as split renal clearance test. Also, this method will be useful as a screening differential renal function test, because of its technical simplicity.