Teaching Session

— Renogram —

Evaluation of Radiopharmaceuticals for Renogram

Y. Sakamoto

Second Department of Medicine, University of Tokyo, Tokyo

Radiopharmaceuticals for the RI renal function test such as for the renal blood flow, GFR, scintigraphy and renogram were evaluated.

(1) Renal blood flow is measured by ^{14}C-, ^{3}H-PAH, ^{131}I-, ^{125}I-o-iodohippurate and ^{131}I-, ^{125}I-iodopyracet renal extraction rate of PAH is 0.9 and can be used for the measurement of the effective renal blood flow. Liquid scintillation spectrometer should be used for the measurement of ^{14}C- & ^{3}H-PAH. By continuous infusion of o-iodohippurate keeping blood level 1-5 mg/dl renal extraction of o-iodohippurate becomes as same as PAH. Iodopyracet in its tracer dose show 20-25% less renal clearance than PAH, however, by keeping blood level 0.5 ng/dl with carrier administration. Clearance becomes as high as PAH. As special radiopharmaceutical for the renal blood flow measurement ^{85}Kr & ^{133}Xe could be used. ^{85}Kr is also used to separate renal cortical blood flow from the rest by using β sensitive solid state detector.

(2) GFR is measured by using ^{203}Hg-, ^{197}Hg chlormerodrin, ^{197}Hg Salyrgan, ^{99m}Tc cystein complex and ^{68}Ga compound.

(3) For the renogram following radiopharmaceuticals are used, ^{131}I-, ^{125}I o-iodohippurate, ^{131}I-, ^{125}Na-iothalamate, ^{203}Hg-, ^{197}Hg-chloromerodrin and Salygan. Renogram by Na iothalamate is an index of GFR of each kidney. Renogram by ^{203}Hg-, ^{197}Hg-chlormerodrin & salygan is used for screening test of renal ischemea and disturbance in the proxismal tabules of the kidney.

O-iodohippurate has higher blood clearance rate renal uptake and renal excretion rate than iodopyracet diatrizonate without hepatic uptake which is found by iodopyracet. Therefore o-iodohippurate is good reagent for renogram. However renal clearance rate of hippuran can be changed according to the way & doses of administration.

For example single injection of trace dose causes decreasing renal excretion by time. Also presence free iodide, causes decreased clearance rate.

A Study on Fundamental Problems of Radiorenogram

N. Yui

National Cancer Center, Division of Radiology, Tokyo

The radioisotope renogram is one of the most popular functional tests of the kidney; and not only qualitative but also quantative analysis have been investigated by many workers. However, we have to recognize the fact that the information obtained is always affected by many factors which lead us to an erroneous judgement, since this is merely a kind of external counting test. Hence, it is most important to standardize the equipments to be used as well as the procedure itself upon the fundamental experiments. From this aspect I have carried out several experiments, and the conclusion is as follows:

1) The lead shield must have the thickness which is enough to reduce the counts of peak gamma ray from the outside of the visual field to less than 1% of those from the visual field. Two centimeters in thickness is necessary for the side shielding.

2) The whole kidney must be covered completely by the visual field of the collimator, while the opposite kidney and bladder should be out of the incomplete visual field.

3) The influence of body background is reduced by counting the peak gamma ray of iodine-131. However, the influence on the counts caused by the change of distance between the skin and kidney is less in counting the gamma rays that include scattered region.

4) In sitting position, the right kidney sometimes shows a depressed secretory phase on the renogram, which is often improved to a normal level by choosing a prone position in an additional procedure.

5) From the view point of an accurate follow on the initial spike and the statistical error, the time constant of 2 seconds is most advantageous. However, even 10 seconds can be used if an accurate follow on the initial spike is unnecessary.

Application of Radioisotope Renogram in Pediatric Field

T. Okada

Department of Pediatrics, Niigata University School of Medicine, Niigata

Here we have reported radioisotope renograms 1) of normal children, 2) of children with postural proteinuria and 3) of children with orthostatic dysregulation.

1) Renogram of normal children

Recently, radioisotope renography is widely performed in children with various renal diseases. However, there are few reports about the renograms of normal children and infants, and it is difficult to appreciate these renograms. Consequently, we have attempted to establish the standard renogram tracings of children, particularly under the age of 3 years.

Renography was performed in 22 normal children under 3 years in prone position. ^{131}I "hippuran" was injected intravenously in a dosage of 0.4 μCi/kg. Renograms were analyzed according to the classification of Johnston.

Renograms from 6 children under the age of one year revealed flat or rising tracings, and subnormal tracings were obtained from only one children of this age. Tracings from children aged one to 2 years were almost subnormal and those of children over the age of 2 years were normal. Thus, it seems that normal tracings of renogram are obtained from children aged one or 2 years, and renogram of children over 2 years reveals always normal curves. In infants under the age of one year, the normal tracing is of flat or rising type, so the appreciation of these renograms must be done carefully.

2) Renogram of children with postural proteinuria

Renography was performed in 28 children with postural proteinuria in standing position at lordosis loading. Forty-six per cent of renograms obtained were abnormal on the left with markedly delayed excretion phase. This fact supports the view, which is most widely accepted in the world, that the renal congestion is a cause of postural proteinuria. Renography performed at lordosis loading seems to be one of the diagnostic aids to postural proteinuria.

3) Renogram of children with orthostatic dysregulation

Renography was performed in 25 children with orthostatic dysregulation in standing