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DETERMINATIONS OF EFFECTIVE RENAL PLASMA FLOW AND GLOMERULAR FILTRATION RATE BY FRACTIONAL RENAL UPTAKE.

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The total and split effective renal plasma flow (ERPF) were determined by the modified Schlegel's method of fractional renal uptake of intravenously administered I-131 hippuran, between 1 and 2 minutes following radiotracer appearance in the kidney. After correcting the obtained renal uptake by depth and dose, the ERPF was computed from the significant correlation with paraaminohippuric acid (PAH) clearance ($r=0.866, y=16.3x + 61.4$). The total and split glomerular filtration rate (GFR) were also determined by the Gate's method of fractional renal uptake of Tc-99m DTPA between 2 and 3 minutes, corrected by depth and dose. The GFR was computed from the significant correlation with sodium thio-sulfate (Na-thio) clearance ($r=0.847, y=8.77x + 9.68$). And total and split filtration fraction (FF) were determined by dividing the GFR with Tc-99m DTPA by the ERPF with I-131 hippuran. The FF of 0.244 ± 0.031 in 22 patients without renal functional impairment was very close to that of 0.242 ± 0.035 determined by the GFR with Na-thio by the ERPF with PAH. The disparities between GFR and ERPF alterations were found among the patients with hypertension following the medical or angioplastic treatment.

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FUNDAMENTAL STUDY OF RENAL DYNAMIC ECT (Deconvolution analysis and functional imaging of Tc-99m-DTPA renal ECT).

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Deconvolution analysis of a renogram derives the transfer function which is the response of the kidney to a bolus injection of radionuclide into the renal artery and gives useful information relating to the spread of renal transit times.

After a bolus injection of Tc-99m-DTPA (5mCi), sequential projection data every 30 seconds were obtained during 15 minutes with a rotating dual gammacamera system. A regional renal transfer function was computed from an input function (a time-activity curve over the cardiac region) and a regional renogram in each pixel of sequential ECT. For each transfer function, three parameters (minimum, mean and maximum transit time) which reflect regional dynamic functions were computed. Computed values for each of three parameters were displayed on a colour CRT.

Under the optimum condition for this method, three dimensional renal functional images showed lower statistical fluctuation and higher image quality. These renal functional images correspond to those obtained from sequential ECT with a direct injection of Tc-99m-DTPA into the renal artery and give more simplified and clarified information on the spread of renal transit times than conventional renal study.

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THE TRIAL CALCULATION OF THE GFR VALUE FOR EACH KIDNEY USING NMR-CT.

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We reported last year in this society about a part of the renal kinetic test method using NMR-CT by Gd-DTPA which is labeled by ourselves.

Now this time we tried to calculate GFR values without blood sampling. The changes of Gd-DTPA concentration on relaxation values ($1/T_1$) followed continuously for one to two hours after intravenous injection of Gd-DTPA.

All images were obtained by the 0.1 Tesla resistive type NMR-CT imaging system (Asahi Mark-J) with T1 (300, 1000) sequence, in 0.05 mmol/kg Gd-DTPA administered rabbit.

GFR values were calculated from some parameters, time constant of excretory phase in NMR renography, injected dose etc. The calculated GFR values of the control rabbits were about 3 to 4 ml/min and the GFR values of renal dysfunction models showed clearly low values compared with normal case.

By the way NMR signal has no scatter photon or attenuation, so it is more suitable to analyze the renal regional dynamic function.

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TC-99m DTPA RENAL SCINTIGRAPHY IN ACUTE TUBULAR NECROSIS. K.Suzuki, M.Mashimo, T.Miyamae, K.Okada and T.Shibata. Saitama Medical School, Saitama.

We have a very interesting Tc-99m DTPA renal scintigram that was performed for acute renal failure patient (11y. male) due to injected Cephalosporin. That image showed almost normal renal perfusion. At early functional phase, renal activity was fairly good. That activity decreased gradually, while bladder activity was not visualized. We thought that it indicated back leakage of acute tubular necrosis (ATN). We attempted to make an experimental study with rabbits in order to get pathological proof for this phenomenon. Rabbits were made dehydrated state and were given Kanamycin and Low Molecular Dextran by intravenous injection. 3 days after the preparation, Tc-99m DTPA renal scintigraphy was performed to them. The scintigram showed ATN pattern as observed in the clinical case. And also pathological examination proved that rabbits kidneys were suffered from ATN. And we investigated the frequency of ATN pattern in renal failure patients. From 1.1984. to 9.1985, there were 11 cases of ATN pattern in 47 acute renal failure patients and 4 cases in 53 chronic renal failure patients.