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THEORETICAL EVALUATION OF PHYSIOLOGICAL VALUE OF RENAL TRANSFER FUNCTION.
T.Nakagawa,K.Takeda,H.Maeda,M.Oi,N.Terada, N.Yamaguchi,T.Kitano and N.Shinoda.Mie University School of Medicine and Mie University Hospital, Tsu, Mie.

Renal transfer function (TF) was calculated by the matrix algorithm using various models of blood curve as input function (I(t)) and renogram as output function (R(t)). I(t) was supposed to be mono- or double exponential function and R(t) was obtained by subtracting bladder curves from a renogram without excretion. The latter was obtained by the integral of a proportion of I(t). The bladder curves were obtained by displacing the multiple fractional renograms without excretion for various transit times. The findings elucidated by this technique are summarized as follows: 1)Initial height of TF is equivalent to the proportion of I(t) accumulated to the kidney per unite time. 2)Without mixing,TF displays a spectrum of transit times along with proportions of the tracer with respective transit times. 3)In case with mixing of tracer in the kidney,TF displays prominent fluctuations with rebound, indicating the presense of retention with or without obstruction. 4)Intra or extrarenal blood background can be automatically eliminated. 5)GFR or ERPF can be estimated from the initial height of TF which is calculated from I(t) corrected by the concentration of a plasma sample obtained after equilibrium and R(T) with attenuation correction.

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CLINICAL EVALUATION OF Tc-99m-DTPA RENAL SCINTIGRAM USING DECONVOLUTION ANALYSIS.
N.Terada T.Matsusita H.Maeda K.Takeda S.Toyota T.Tashiro T.Nakagawa N.Yamaguchi T.Kitano Mie University School of Medicine

Deconvolution analysis was applied to Tc-99m-DTPA renal imaging to get impulse response function of the kidney after direct bolus injection of the tracer, that is renal transfer function (TF). Regional TF over the flagged ROI or each element of the matrix provides information on the proportion of various transit time (TT) and relative GFR by initial height (IH). Minimum TT, mean TT, maximum TT and IH were measured on each TF and displayed as respective functional images (FI) by a color scale. Various renal diseases including pyelonephritis, nephrotic syndrome and obstructive diseases with various grade of renal failure were studied. FI depicted regional distribution of prolonged TT with or without matched distribution of decreased IH. The lesion with matched alternation in TT and IH was considered to have considerable parenchymal damage, while lesion with alternation in TT with normal IH was considered to be simple retention. We believe this method is valuable in evaluating the pathophysiology and the grade of various renal diseases.

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INVESTIGATION IN DECONVOLUTION ANALYSIS OF Tc-99mDTPA SPECT DATA.
M.Ooi,H.Maeda,S.-Toyoda,K.Takeda,T.Nakagawa,N.Yamaguti and T.Kitano, Mie University School of Medicine,Mie.

Regional transfer functional(TF) is obtained by deconvolution analysis of sequential Tc-99mDTPA renal SPECT data. Minimum,Mean,Maximum transit time(TT)and intial height(IH)related to GFR are measured on the TF over the flagged ROI or each element of the matrix. The distribution of the values were displayed in a color scale to construct respective functional image(FI). In the ischemic lesion, such as renovascular hypertension or infarction,TF showed gradually or stepwise declining pattern without rebound and FI depicted matched distribution of decreased IH and prolonged TT. In the lesion with focal retention,TF showed sharp rebounds and FI depicted localized distribution of prolonged TT with or without matched distribution of decreased IH. This method was considered to be very usefull in evaluating renal pathophysiology since it gives information on combined regional functions of GFR as IH and excretory function as TT.

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Evaluation of renal dynamics by factor analysis.
Takashi Ozawa, Takano Masaaki, Sonoo Mizuiri, Akira Hasegawa, Kiyofumi Hirata. Department of Nephrology. School of Medicine, Toho University.
Yasuto Sasaki.
Department of nucular medicine.
School of Medicine, Gunma University.

We applied factor analysis to evaluation of renal dynamic structures. Factor analysis was performed using Tc-99m DTPA and/or I-131-OIH renal dynamic imaging.
In the normal kidney, three charactristic patterns (vascular, parenchymal and drainage) could be discerned as compotents of factor analysis. In obstructive uropathy, the abnormal drainage components could be divided. In renovascular hypertension, I-131-OIH renography curve of the affected kidney was changed to obstructive pattern. This change of renal dynamics were manifested in factor analysis. Hence, factor analysis is considor to be useful, especially to evaluate obstructive pattern renogram.