A Study on a Clinical Application of Regional Renograms

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Present study was undertaken to analyze intra-renal radioisotopic distribution for clinical use. $^{197}$Hg-chlormerodrin renoscintigraphy and $^{131}$I-hippuran camera renography were performed for 29 subjects, which had no evident local lesion such as tumors, cysts and hydronephrosis. The data were collected in digital form on magnetic tapes at the sampling time of 10 sec. for 20 min. after intravenous administration of $^{131}$I-hippuran. Using $^{197}$Hg-renoscintigram displayed on a CRT, rectangular envelope was made around a kidney and each kidney was divided into 4 layers parallel and 3 columns perpendicular to its longitudinal axis, yielding 12 regions per kidney. Digitized regional $^{131}$I-hippuran renograms for 12 regions were calculated by playing back magnetic tapes. These patterns, named regional renograms, provided a basis of objective comparison of regional $^{131}$I-hippuran kinetics within each kidney. To extract functional components of the intra-renal radioisotopic distribution and investigate functional similarity among the 12 regions, principal component analysis with varimax rotation was applied. 29 subjects were divided into 3 groups (14 standard, 13 delayed and 2 hypofunctional types) according to their total renograms. Means and standard deviations of factor loadings of components in each region were calculated in 3 groups.

Results obtained were: (1) 2 main components were extracted from a set of regional renograms of kidneys which had no evident local involvement. (2) These 2 components were compared with curves obtained directly from ROIs set in substantial and pelvic regions of a kidney. They showed high correlation respectively. Therefore, a main functional components of regional renograms were radioisotopic distribution in the substantial and pelvic regions. (3) Means of factor loadings in 12 regions were plotted in 2 dimensional planes of 2 components. Means of factor loadings were shifts to the center as the types of renogram curves changed from standard type to delayed and hypofunction type. The result suggests that the time-course of intra-renal damages are characterized as the loss of the features of substantial and/or pelvic components. This analysis method of intra-renal radioisotopic distribution will be applicable to the decision of the stage of intra-renal involvement of kidneys which have no evident local lesion.