1124

QUANTITATION OF REGIONAL CEREBRAL BLOOD FLOW WITH AUTORADIOGRAPHY METHOD USING I -123 IMP SPECT —REPRODUCIBILITY OF RCBF AND ITS CLINICAL USEFULNESS—

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Reproducibility of regional cerebral blood flow(rCBF) values with the Autoradiography(ARG) method using I-123 isopropyl-p-iodoamphetamine(IMP) SPECT was evaluated and its clinical usefulness was studied. The technical error in rCBF values by the cross calibration factor and arterial blood sampling time difference was within 4%. There was a favorable correlation between the rCBF values in two separate scans measured by the ARG method in 4 patients (r=0.93), however, rCBF values measured in the 2nd scan tended to be of a lower value. In a case with right internal carotid occlusion and left internal carotid stenosis, left carotid endarterectomy was performed. In this case, no significant difference in rCBF was observed by the qualitative interpretation between pre- and post-operative IMP images. However, the increase in rCBF over 10% was detected in the post-operative rCBF value measured with the ARG method. Reproducibility of rCBF with the ARG method was good. Therefore, we think that the ARG method is useful as a clinical means which can be applied to observe a rCBF improvement after a operation.

1126

SIMPLE QUANTIFICATION OF REGIONAL CEREBRAL BLOOD FLOW WITH CONTINUOUS INFUSION OF Tc-99m ETHYL CYSTEINATE DIMER AND DYNAMIC SPECT.

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We propose a new method to quantify regional cerebral blood flow (rCBF) using continuous infusion of Tc-99m ethyl cysteinate dimer (ECD). Thirteen subjects were studied. During constant infusion of ECD (740 MBq) over 10 min., dynamic SPECT scans, intermittent arterial blood samplings and octanol extraction were performed every one minute to obtain an arterial input function. Influx constant (Ku) was obtained with Patlak plot method, which was compared with rCBF measured by PET using O-15 CO_2 steady state method (F). To minimize the arterial sampling, simulated arterial input function calibrated by the arterial blood sampled at the end of the scan. Ku was linearly correlated with F (Ku = 0.082 + 0.632F, r=0.84, P<0.05). Ku calculated with the measured input function and that with simulated arterial input (Ku') showed high correlation (Ku' = -0.019 +0.997 Ku, r=0.92, p<0.01). Proposed method with one-point arterial sampling is a simple, clinically feasible tool for quantitative measurement of rCBF.

1137

A SIMPLIFIED REGISTRATION SYSTEM OF SPECT AND MR IMAGES AND ITS CLINICAL APPLICATION.

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A simplified and precise registration system of SPECT (Siemens, MultiSPECT3) and MR (Siemens Magnetom Impact Expert) images was developed and applied to routine clinical studies. Multi-slice gapless MR images with the same scale as SPECT images were obtained using a 3-D turbo FLASH technique and converted to readable images by a processing SPECT console using a Siemens Optical 1.2 program. These converted MR images were three-dimensionally registered to SPECT images using transaxial, coronal, and sagittal images. A phantom study was also performed to validate this registration. With the use of this system the location of SPECT abnormalities was accurately recognized and ROI setting for SPECT images was done on registered MR images. This system is clinically useful because of unnecessity of special workstation or surface markers.

1138

SCATTER AND ATTENUATION CORRECTION FOR I-123 BRAIN SPECT USING THE TEW METHOD AND SIMULTANEOUS Tc-99m TRANSMISSION SCAN.

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The aim of this study is to obtain quantitative I-123 brain SPECT with scatter and attenuation correction. We used a triple-headed SPECT gammacamera system equipped with fan-beam collimators with a Tc-99m line transmission source place at one of the focal line of the fan-beam collimators. Four energy windows were employed for data acquisition:① 126-132keV, ② 132-143keV, ③ 143-175keV, and ④ 175-186keV. A simultaneous transmission-emission scan (TCT-ECT) was carried out for a brain phantom containing I-123 solution. The TEW scatter correction was applied to the I-123 ECT data in the windows ②, ③, and ④ acquired by two detectors. Attenuation maps for Chang's correction were reconstructed from Tc-99m TCT data in the windows ①, ②, and ③ acquired by one detector. We conclude that this protocol was clinically practical because it requires only one scan using a Tc-99m external source.