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COMPARISON OF DYNAMIC 2D AND 3D BRAIN PET FOR KINETIC ANALYSIS OF C-11 WIN 35,428 BINDING TO DOPAMINE TRANSPORTERS

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3D PET data acquisition is now being used for clinical FDG-PET brain studies. However, its validity for studying kinetics of receptor-ligand interaction has not been fully evaluated. To examine the feasibility and quantitative accuracy of dynamic 3D brain PET for kinetic analysis of radioligand binding, 4 healthy volunteers and 1 Parkinson's disease patient were studied. Each subject received two 555 MBq C-11 WIN 35,428 injections and a dynamic sequence of 31 scans were acquired until 90 min p.i. in 2D and 3D mode using a GE Advance PET scanner. Both 2D and 3D image sets were reconstructed employing a Hanning filter 4.5 mm and resulting axial resolution was about 7 mm for both 2D and 3D images. The 3D data were corrected for scatter employing a method using 2D fitted Gaussian functions. Attenuation correction was performed using a 20 min transmission scan. Tissue time-activity curves were generated in the striatum and cerebellum. The forward (k3) and dissociation (k4) rate constants were calculated in the striatum using a two-compartment model, which consists of free plus nonspecifically bound (cerebellar) and specifically bound (striatal − cerebellar) compartments. The 3D kinetic results were comparable to the 2D results and within the expected range. The 3D %SE was less than 2D %SE. Striatal-to-cerebellar ratios from 2D and 3D images showed excellent correlation and agreement ($r=0.994$, $p<0.0001$, slope=0.952). The plot of striatal-to-cerebellar ratios versus time showed a linearly increasing pattern, with significantly lower RMSE in 3D than in 2D studies in linear regression analysis (0.119 ± 0.025 vs. 0.276 ± 0.087, $p=0.028$). These preliminary data suggest that 3D PET provides more reliable tissue kinetic data for the analysis of C-11 WIN 35,428 kinetics. Improved sensitivity in 3D may allow more accurate receptor characterization, especially in small brain structures or in low specific binding areas.

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PREDICTIVE VALUE OF DIAMOX STRESS BRAIN SPECT FOR THE USE OF SELECTIVE SHUNTING DURING CAROTID ENDARTERECTOMY(CEA).

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Purpose: The purpose of this study was to evaluate whether diamox stress brain SPECT is an adequate method of predicting the need for selective shunting during CEA and determining the indication group for the use of prophylactic shunt. **Material and Methods:** Fifty-one CEAs were performed in 51 patients (45 symptomatic, 6 asymptomatic) with selective shunting based on the change of consciousness during carotid clamping under regional anesthesia. Both carotid arteries were evaluated by angiography. Basal/diamox stress brain SPECT using ^{99m}Tc-ECD were performed in the same day within 2 weeks before CEA. One investigator performed visual assessment of regional cerebral blood flow(rCBF) and cerebrovascular reactivity(rCVR) on SPECT. The SPECT images were divided into four groups: Type N/N, normal rCBF/normal rCVR; Type R/N, reduced rCBF/normal rCVR; Type N/R, normal rCBF/reduced rCVR; Type R/R, reduced rCBF/reduced rCVR. The severity of reduced rCBF and rCVR was also graded. The results of SPECT images were compared with the severity of contralateral carotid stenosis. **Results:** Selective shunting was performed in 10 patients who had change of consciousness during carotid clamping. Selective shunting was higher in patients with reduced rCVR(Type N/R, R/R) regardless of rCBF than normal rCVR and with severe contralateral carotid stenosis than others($p=0.001$). All of 5 patients having severely reduced rCVR and Type R/R with severe contralateral carotid stenosis performed selective shunting. Incidence of selective shunting according to the type of SPECT and degree of contralateral carotid stenosis are shown in the table. **Conclusion:** Diamox stress brain SPECT may be helpful in the preoperative evaluation of risky patients for cerebral ischemia during carotid clamping. Patients having severely reduced rCVR or reduced rCBF/rCVR with severe contralateral carotid stenosis may be indicated for prophylactic shunt during CEA.

Incidence of Selective Shunting

	Contralateral carotid stenosis		
Type of SPECT	<70%	70 - 100%	Total
N/N	1/11(9%)	0/3	1/14(7%)
R/N	0/16	1/4(25%)	1/20(5%)
N/R	2/ 6(33%)	0/2	2/ 8(25%)
R/R	1/ 4(25%)	5/5(100%)	6/ 9(67%)
Total	4/37(11%)	6/14(43%)	10/51(20%)