

QUANTITATIVE GLOBAL ASSESSMENT OF CEREBRAL PERFUSION CHANGES VIA 3D PERFUSION ISOSURFACES IN PATIENTS WITH ALZHEIMER'S DISEASE USING IODINE-123-IMP SPECT AND AUTORADIOGRAPHY PROTOCOL

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Objectives: To evaluate the use of 3D perfusion isosurface measures as a new method for providing a rapid overall quantitative assessment of global cerebral blood flow (gCBF) compared to the conventional 2D ROI method. 3D perfusion isosurface measures capture information about the spatial pattern of perfusion that is unattainable by the 2D ROI method and are therefore capable, in principle, of delivering new qualitative and quantitative information about cerebral blood flow. **Methods:** Changes in fifteen patients with dementia of Alzheimer type (DAT) treated with donepezil hydrochloride therapy [mean age - 71.4 yrs, mean Mini-Mental State Examination (MMSE) score - 18.3] were evaluated. Iodine-123-IMP SPECT baselines were acquired before treatment. SPECT Iodine-123-IMP data was subsequently re-acquired for each subject at a mean interval of 10 months. For tracer uptake quantification, Iodine-123-IMP SPECT data was normalized using the autoradiography protocol. Perfusion isosurfaces at 20, 30, 40, and 50 [ml/min/100g] were generated in 3D using BrainGuide software. Associated with each isosurface value, BrainGuide also generated 1) the surface area associated with a isosurface value, 3D-PSA, 2) the volume of brain tissue enclosed by the selected isosurface, 3D-PSV, 3) the derived ratio, 3D-PSR = 3D-PSA / 3D-PSV, and 4) the integral of total blood flow within the enclosed isosurface, 3D-PSEV. **Results:** In follow up SPECT, a statistically significant increase in gCBF was indicated by 3D perfusion isosurface measures ($p < 0.01$). Although no significant change in rCBF was observed in any region of the 5 cases using the conventional 2D ROI method, 3D perfusion isosurface measures revealed increased 3D-PSA, 3D-PSIV, and 3D-PSEV in 3 cases and decreased 3D-PSA, 3D-PSIV, and 3D-PSEV in 2 cases. All cases showed a tendency to be correlated to MMSE score changes. **Conclusion:** 3D perfusion isosurface measures may prove to be a set of more accurate and sensitive techniques for rapid, quantitative, clinical assessment of the global progress of DAT in patients and the efficacy of treatments.