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Changes of Regional Cerebral Blood Flow in Acute Stroke Patients Assessed by SPECT

Thesis Submitted for Partial Fulfillment
in the MD Degree in Neurology

By

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ABSTRACT

Background: Tc-HMPAO SPECT is a non-invasive technology that has a potential diagnostic tool in stroke. Several studies have supported the predictive value of SPECT in stroke prognosis.

Purpose: Studying the role of Tc-HMPAO SPECT in assessment of rCBF changes in acute stroke patients and evaluation of its role in early diagnosis and prognosis of stroke.

Material and Methods: Forty Egyptian patients presented with acute onset of stroke were subjected to The Oxfordshire Community Stroke Project (OCSP) classification, National Institutes of Health Stroke Scale (NIHSS), CT brain and single photon emission computed tomography (SPECT) at day one of stroke onset. At day seven, 30 patients were reevaluated by NIHSS to assess the clinical outcome and SPECT to follow the pattern of cerebral perfusion.

Results: *At Day one*: CT scans were positive in only 18 (45%) patients, while SPECT scans were positive in all 40 (100%) patients ($p< 0.001$). NIHSS was significantly higher in patients with corticosubcortical hypoperfusion lesions than in patients with cortical hypoperfusion on SPECT *($p< 0.01$)*. NIHSS was worst with large hypoperfusion than small hypoperfusion on SPECT *($p< 0.001$)*. The less the radiotracer uptake on SPECT, the worse the NIHSS *($p<0.01$)*. There was a statistically significant negative correlation between NIHHS and rCBF *($r= -0.640$)*. *At Day seven*: rCBF was highly significantly better *($r = 0.59$)*. NIHSS at day 7 was worse in patients with corticosubcortical hypoperfusion lesions than in patients with cortical hypoperfusion on SPECT at day 1 *($p< 0.01$)*. The larger the size of hypoperfusion on SPECT at day 1, the worse the NIHSS at day 7. *($p<0.05$)*. The less the radiotracer uptake on SPECT at day 1, the worse the NIHSS at day 7*($p<0.05$)*. The less the rCBFat day 1, the worse the NIHSS at day 7 *($r= -0.685, p<0.001$)*.

Comclusion: SPECT was more sensitive than CT in detecting acute cerebral ischemia. There was significant relation between clinical assessment of stroke patients and findings on SPECT at day one. Tc-HMPAO SPECT could predicts early clinical outcome of stroke.

Key words: acute stroke, SPECT, CT, prognosis.

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i-List of Abbreviations

- **ABP:** Arterial blood pressure
- **ACA:** Anterior cerebral artery
- **AD:** Alzheimer's disease
- **ADC:** Apparent diffusion coefficient
- **AIDS:** Acquired immune deficiency syndrome
- **ASL:** Arterial spin-labeling
- **ATP:** Adenosine triphosphate
- **AVM:** Arteriovenous malformation
- **BBB:** Blood brain barrier
- **CA:** Cerebral autoregulation
- **Ca^{++}:** Calcium ions
- **CAMP:** Cyclic 3',5'-adenosine monophosphate
- **CBF:** Cerebral blood flow
- **CBV:** Cerebral blood volume
- **CCD:** Contralateral cerebellar diaschisis
- **CCH:** Crossed cerebellar hypoperfusion-hypometabolism
- **CGRP:** Calcitonin gene-related peptide
- **CMRO2:** Cerebral metabolic rate of oxygen
- **CNC:** Canadian Neurologic Scale
- **CPP:** Cerebral perfusion pressure
- **CT:** Computerized tomography
- **CTA:** Computerized tomography angiography
- **CTP:** Perfusion-weighted computerized tomography
- **DSC:** Dynamic susceptibility contrast
- **ECD:** Ethyl-cysteinate-dimer
- **EEG:** Electroencephalography
- **GMP:** Guanosine monophosphate

- **H:** Hour
- **H^+ :** Hydrogen ions
- **HMPAO:** Hexamethylpropylene amine oxime
- **ICA:** Internal carotid artery
- **IL:** Interleukin
- **IMP:** 123I-iodo-isopropyl-amphetamin
- **LACS:** Lacunar syndromes
- **MABPs:** Mean arterial blood pressures
- **MCA:** Middle cerebral artery
- **MRI:** Magnetic resonance imaging
- **MTT:** Mean transit time
- **NIHSS:** National Institutes of Health Stroke Scale
- **NMDA:** N-methyl-D-aspartate
- **NO:** Nitric oxide
- **OCSP:** The Oxfordshire Community Stroke Project
- **OEF:** Oxygen extraction fraction
- **$PaCO_2$:** Partial pressure of carbon dioxide
- **PACS:** Partial anterior circulation syndromes
- **PAF:** Platelet activating factor
- **PaO_2:** Partial pressure of oxygen
- **PET:** Positron emission tomography
- **PROACT II:** Prolyse in Acute Cerebral Thromboembolism II
- **rCBF:** Regional cerebral blood flow
- **rCBV:** Regional cerebral blood volume
- **rCVR:** Regional cerebrovascular reserve
- **ROI:** Region of interest
- **rTPA:** Recombinant tissue plasminogen activator
- **SAH:** Subarachnoid hemorrhage
- **SPECT:** Single photon emission computed tomography

- **TACS:** Total anterior circulation syndromes
- **Tc:** Technetium
- **TCD:** Transcranial Doppler sonography
- **TIAs:** Transient ischaemic attacks
- **Tl^{201} :** Thallium
- **TNF:** Tumor necrosis factor
- **Xe^{133}:** Xenon

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