Ischemic brain diseases:
Diffusion and perfusion MRI

Essay
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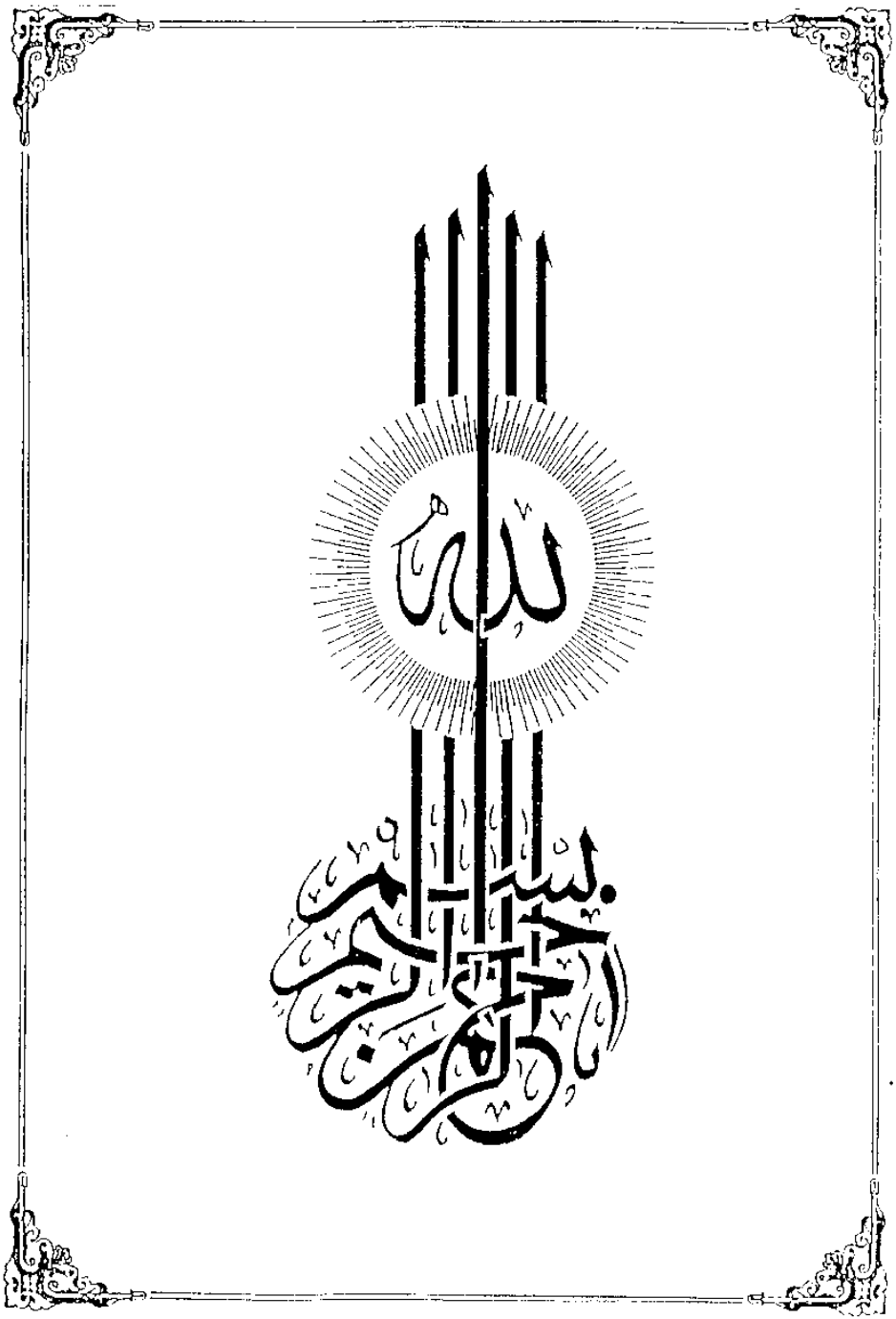

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Abbreviations

ADC	Apparent diffusion coefficient
CPP	Cerebral perfusion pressure
CT	Computed tomography
D	Diffusion coefficient
DWI	Diffusion-weighted imaging
EPI	Echo plannar imaging
FAIR	Flow-sensitive alternating inversion recovery
FLAIR	Fluid attenuated Inversion recovery
Gd-DPTA	Gadolinium Diethylentriamine pentaacetic acid
IVIM	Intra-voxel incoherent motion
MRI	Magnetic resonace Imaging
PET	Positron emission tomography
rCBF	regional Cerebral blood flow
rCBV	regional Cerebral blood volume
SPECT	Single photon emission computed tomography
TO	Time of arrival
TTP	Time to peak

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Introduction

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Stroke has a major social and economic impact on our modern society, and is now the subject of a considerable research effort due to its very high prevalence **(Imakita et al., 1987).**

In ischemic brain diseases, there is a delay between onset of clinical symptoms and development of permanent damage. There is a growing awareness that early intervention after cerebral infarcts will considerably reduce mortality and morbidity **(Camarata PJ, Heros RC, Latchaw RE, 1974).**

Current imaging modalities that focus on the anatomical structures as CT and MRI can miss these early changes giving a normal picture until permanent damage has occurred. This initiated the need to perform functional imaging in ischemic brain diseases e.g. diffusion and perfusion imaging. *Diffusion* being defined as the manner by which nutrients diffuse through capillary walls of cerebral tissues and *perfusion* being the vascular process by which nutrients are delivered to the brain.

Up to nowadays, a variety of modalities are tried for studying brain perfusion including PET, SPECT and CT. These methods are all based on observing the hemodynamic dilution of an indicator substance introduced into the blood. In fact, the same principle is used in MRI **(Meier P et al., 1984).**

MRI is capable of providing functional images not only showing diffusion but also perfusion in the brain. These images can

show the presence of ischemia, infarction, as well as abnormalities in cerebral blood volume and flow, at a very early stage after the onset of stroke.

This work aims at highlighting the role of MRI diffusion and perfusion in early detection of ischemic brain diseases.