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MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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Quantitative assessment of MRI lesion load in cerebral Multiple Sclerosis: A comparison of conventional sequences and Double Inversion Recovery

Thesis

Submitted for Partial Fulfilment of Master Degree in Radiodiagnosis

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List of Contents

List of Abbreviations

Abb.	Full term
ACA	Anterior Cerebral artery
ACHA	Anterior Choroidal artery
AICA	Anterior Inferior Cerebellar Artery
BBB	Blood–brain barrier
BMI	Body mass index
CIS	Clinically isolated syndrome
CNS	Central nervous system
CSE	Conventional spin echo
DIR	Double Inversion Recovery
DWM	Deep White Matter
EBV	Epstein Bar Virus
FLAIR	Fluid-Attenuated Inversion Recovery
GM	Grey Matter
HLA	Human leukocyte antigen
ICA	Internal Carotid Artery
IR	Inversion Recovery
MCA	Middle Cerebral Artery
MRI	Magnetic Resonance Imaging
MS	Multiple sclerosis
NAWM	Normal appearing White Matter
NMR	Nuclear magnetic resonance
NMV	Net magnetization vector
PCA	Posterior Cerebral Artery
PICA	Posterior Inferior Cerebellar Artery
PPMS	Primary progressive multiple sclerosis
RIS	Radiologically isolated syndrome
RRMS	Relapsing Remitting Multiple Sclerosis
SCA	Superior Cerebellar Artery
SE	Spin Echo

List of Abbreviations Cont...

Abb.	Full term
SPMS	Secondary progressive multiple sclerosis
STIR	Short-TI Inversion Recovery
T1WI	T1-weighted images
T2 TSE	Turbo spin-echo
T2WI	T2-weighted images
TCRs	T- Cell Receptors
TE	Time to Echo
TI	Inversion Time
TR	Repetition Time
WM	White Matter

List of Tables

List of Figures

List of Figures Cont...

List of Figures Cont...

INTRODUCTION

Multiple sclerosis (MS) is the most common chronic inflammatory demyelinating disease of the central nervous system (CNS), that is characterized by focal demyelinating plaques and diffuse neurodegeneration, resulting in both physical and neurocognitive disability ***(Vural et al., 2013)***.

Although MS has been known as a white matter disease, MS lesions occur in all CNS parenchymal areas, including cerebral cortex and deep grey matter.

Approximately two million people worldwide are affected by this disorder, and it is the most common non-traumatic neurological disability affecting young adults ***(Manogaran et al., 2016).***

Multiple Sclerosis (MS) is diagnosed according to the McDonald criteria which are clinical, radiographic and laboratory criteria. They were originally introduced in 2001 and revised multiple times, most recently in 2017. The McDonald Criteria have resulted in earlier diagnosis of MS with a high degree of both specificity and sensitivity, allowing for better counseling of patients and earlier treatment ***(Thompson et al., 20l7)***.

Magnetic resonance imaging (MRI) has played a very important role in elucidating the pathophysiology, diagnosis and treatment of MS. According to the McDonald criteria for MS, the diagnosis requires objective evidence of lesions disseminated in time and space. As a consequence there is an

important role for MRI in the diagnosis of MS, since MRI can show multiple lesions (dissemination in space), some of which can be clinically occult, and MRI can show new lesions on follow up scans (dissemination in time) ***(Vural et al., 2013)***.

The FLAIR sequence is a sequence that suppresses the signal of cerebrospinal fluid (CSF) with a reverse cycle (inversion recovery) pulse and a high time Echo (TE values increase) T2- weight. This sequence increases the contrast of supratentorial lesions, in particular lesions that arise in juxtaposition to the CSF but is less sensitive in the posterior fossa ***(Geurts et al., 2005).***

A T2WI relies upon the transverse relaxation (also known as "spin-spin" relaxation) of the net magnetization vector (NMV). T2 weighting tends to require long TE and TR times. T2-weighted conventional spin-echo or turbo spin-echo (T2 TSE) sequences are known to be more sensitive in the detection of infratentorial lesions but have difficulties detecting juxtacortical lesions. DIR sequence produces two different inversion pulses, which attenuates the CSF together with the whole white matter, thus providing a remarkable delineation between gray and white matter. MS plaques located in the grey matter are more easily delineated using DIR ***(Wattjes et al., 2007).***