

الآية الكريمة

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(قُلْ هَلْ يَسْتَوِي الَّذِينَ يَعْلَمُونَ وَالَّذِينَ لَا

يَعْلَمُونَ إِنَّمَا يَتَذَكَّرُ أُولُو الْأَلْبَابِ)

صدق الله العظيم

سورة الزمر

الآية رقم (9)

Dedication

To

The soul of my father and mother,

My brothers and sisters for their help and support

My wife and children for their patience,
understanding

And encouragement.

My teachers, friends and colleagues for their
inspiration

Encouragement and guidance

Acknowledgment

My acknowledgements and gratefulness at the beginning and at last is to God who gave us the gift of the mind. Profound thanks and gratitude to everyone who encouraged me to complete this thesis. My great thanks and deep gratitude to my supervisor Dr. Caroline Edward for her advice suggestion and help. Also very special thanks to DR.Hussain Ahmed Hassan, who helped in performing the practical part of this research, with his full patience and cooperation My gratitude is also extended to the staff of (The Modern Medical Ceter,Alamal,Military Hospital) MRI department for their patience and helping in collecting data. Finally I would like to warmly thank of my long-suffering family for never-ending support.

Abstract

The aim of the study was to characterize the substantia nigra in different diseases by means of MRI. The study was conducted at Alamal, Modern Medical Center and the Military Hospital MRI centers in Khartoum state during the period from 2012 to 2016. The study included 40 patients with Parkinson, 29 males and 11 females, 18 with schizophrenia, 14 males and 4 females, and 42 with epilepsy, 27 males and 15 females and 50 considered as control subject, 37 males and 13 females.

Fifty control subjects and forty patients with Parkinson disease were imaged in T1, T2; Fluid attenuation at inversion recovery (FLAIR) weighted sequence at MRI machine 1.5 Tesla. The control group consisted of 37 (74%) males and 13 (26%) females, 30 to 86 years old (mean age, 49.04 ± 11.51 years).

The group with Parkinson's disease included 29 (72.5%) males and 11 (27.5%) females, 46 to 77 years old (mean age, 60.42 ± 7.84 years) with a mean duration of

Disease 7.8 ± 3.5 years In axial T2 weighted MR images of the midbrain, which included the mammillary body and red nucleus, the right and left substantia nigra width and length, were measured; compared with the control group and were correlated with patients ages and disease duration. Compared with that of controls, loss of substantia nigra was evident in patients. The visible substantia nigra length and width were significantly smaller in patients compared with controls $P=0.005$ with hypointense character on T2 weighted images. The duration of Parkinson disease has a significant impact in the nigral width reduction. T2 weighted images provide a convenient way to visualize substantia nigra degeneration in Parkinson disease. New equations were established to predict the nigral width in the progression of Parkinson disease and age related changes in normal subjects.

Schizophrenia is a serious mental disorder that affects several brain functions. MRI technology has enabled studies of brain anatomy in patients with schizophrenia aimed at understanding more about the substantia nigra, Lateral ventricles and Temporal Lobes in schizophrenia disease. Eighteen patients with schizophrenia were examined (M: F = 14:4 Mean age: 44.77 years) and 50 healthy controls. Using a 1.5T MRI unit, T2-weighted axial images were obtained.

The length and width for the substantia nigra (SN), lateral ventricles and temporal Lobes were measured as well as identified signal intensity which was

Compare Between patients and healthy controls using unpaired *t*-tests. Results showed that the signal intensity in schizophrenic patients differs from normal healthy Subjects.

The measured values of (SN) and Lateral ventricles in patients were significantly greater than those in healthy Controls at $p < 0.01$.

Furthermore, no difference in temporal lobes between schizophrenia patients and controls were observed. The research shows that schizophrenia has neuro- correlation that can be seen by studying MR images.

Also 42 patients with epilepsy disease were imaged in T1, T2, And FLAIR weighted sequence at 1.5 Tesla. In axial T2 weighted MR images, the right and left substantia nigra width and length, were measured and compared with the control group.

No significant differences found between the control subject and epileptic patients.

This study demonstrates that MR imaging with T2 weighted imaging is useful for detecting the changes in the width and length of the substantia nigra in Parkinson disease patients. New equations were established to predict the changes in substantia nigra in normal subjects and patients with Parkinson disease. Thereby, the magnetic resonance imaging with T2 weighted imaging was useful to distinguish patients with PD from controls.

المستخلص

الهدف من هذه الدراسة هو توصيف المادة السوداء فى الامراض المختلفة عن طريق التصوير بالرنين المغنطيسى.وقد أجريت هذه الدراسة في المركز الطبى الحديث,مستشفى الامل ومستشفى

السلاح الطبى باقسام الرنين- المغنطيسى- بولاية الخرطوم خلال الفترة من ر 2012 إلى 2016م .

وشملت الدراسة 40 مريضا بمرض باركنسون,29ذكور و 11 اناث,و18مريضا بانفصام الشخصية,14ذكور و4 اناث,و42مريضا بمرض الصرع,27ذكور و 15 اناث و 50 اصحاء كمجموعة تحكم,37ذكور و 13 اناث.

خمسون (مجموعة التحكم) و اثنين واربعون مريضا بمرض باركنسون تم تصويرهم بالزمين الاول T1 والثانى T2 وزمن توهن السوائل FLAIR بواسطة جهاز رنين مغناطيسى 1.5تسلا .

مجموعة التحكم تتكون 74% , 37 ذكور و13% , 26 اناث,30-86 سنه,متوسط الاعمار .
11.5±49.04

مجموعة مرضى باركنسون تتضمن 72.5% 29 ذكور و 27.5% 11 اناث,46-77 سنه متوسط الاعمار 60.4 7.8 ,متوسط مدة المرض 3.5 ± 7.8 سنه.

تم تصويرهم فى زمن الاسترخاء المحورى الثانى للدماغ الاوسط الذى يتضمن الجسم الحلمى والنواء الحمراء,وتم قياس عرض وطول المادة السوداء اليمنى واليسرى ومقارنته بمجموعة التحكم وربطه بعمر المريض ومدة المرض .

بالمقارنة مع مجموعة التحكم, وجد نقص فى المادة السوداء فى المرضى- (وجد فرق كبير بين-
المرض ومجموعة التحكم بين طول وعرض المادة السوداء,القيمه الاحتمالية 0.005 مع صفة
انخفاض الإشارة فى الزمن الثانى.كذلك وجد ان مدة المرض عند مرضى- باركنسون لها تاثير
كبير فى تقلص عرض المادة السوداء.

التصوير بالزمن الثانى T2 يوفر طريقه مناسبة لمعرفة تقلص المادة السوداء فى مرض
باركنسون.

وجدة معادلات جديدة للتنبؤ بعرض المادة السوداء عند تقدم مرض باركنسون والتغيرات
العمرية ذات الصلة عند الاصحاء.

انقسام الشخصية اضطراب عقلى خطير يؤثر على عدة وظائف فى المخ.وقد مكنت تكنولوجيا
التصوير بالرنين المغنطيسى دراسات تشريح الدماغ فى المرضى الذين يعانون من مرض انقسام
الشخصيه ,هدفت لفهم المزيد عن المادة السوداء والبطين- الجانبي والفص الصدغي فى مرض
انقسام الشخصية.

تم فحص ثمانية عشر- مريض بانقسام الشخصية ,14ذكور و 4 اناث,متوسط الاعمار
44.77 وخمسون . مجموعة تحكم باستخدام جهاز 1.5 تسلا .وقد تم الحصول على الزمن
المحورى الثانى.

تم قياس الطول والعرض للمادة السوداء والبطين الجانبي والفص الصدغى، فضلا عن تعريف مستوى الإشارة تم مقارنة بين المرض الاصحاء باستخدام اختبارات الاحصائى.

اظهرت النتائج ان مستوى الإشارة عند مرضى انفصام الشخصية يختلف عن مستوى الإشارة عن مجموعة التحكم.

وكانت القيم المقاسة من المادة السوداء والبطين الجانبي فى المرضى- اكبر بكثير من تلك التى عند الاصحاء القيمة الاحتمالية 0.01, علاوة على ذلك لوحظ انه لا يوجد اختلاف فى الفص الصدغى بين مرضى انفصام الشخصية ومجموعة التحكم.

ايضا اربعون مريضا بالصرع تم تصويرهم بالزمنين الاول والثانى وزمن توهن السوائل بواسطة 1.5 تسلا

فى زمن الاسترخاء المحورى الثانى ,تم قياس عرض وطول المادة السوداء اليمنى واليسرى ومقارنته بمجموعة التحكم. لم يوجد فرق كبير بين المرض ومجموعة التحكم.

هذه الدراسة تبين ان التصوير بالرنين المغنطيسى مفيد للكشف عن التغيرات فى عرض وطول المادة السوداء فى مرضى باركنسون.تم انشاء معادلات جديدة للتنبؤ بالتغيرات فى المادة السوداء عند الاصحاء والمرضى الذين يعانون من مرض باركنسون.لذلك التصوير بالرنين المغنطيسى بالزمن المحورى الثانى مفيد للتمييز بين مرضى باركنسون والاصحاء

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Abbreviations

MRI	Magnetic resonance imaging
NMR	Nuclear magnetic resonance
CT	Computed tomography
FA	Flip angle
NEX	Number of excitation
PD	Parkinson disease
SN	Substantia nigra
FOV	Field of view
GE	General Electric
ETL	Echo train length
RF	Radio frequency
FSE	Fast spin echo
SE	Spin echo
SNR	Signal to noise ratio
EPI	Echo planer imaging
T	Tesla
T1w	T1-weighted image
T2W	T2-weighted image
DWI	Diffusion
GMN	Gradient moment nulling
TE	Time to echo
TR	Time to repeat
STIR	short time at inversion recovery
FLAIR	Fluid attenuation at inversion recovery
GRE	Gradient echo
TLE	Temporal lobe epilepsy
CSF	Cerebro spinal fluid

CM	Contrast Media
DP	Dopamine
IR	Inversion recovery
REM	Rapid eye movement
L-dopa	Levodopa
CNR	Contrast-to ratio
NMV	Net Magnetization vector
MHZ	Megahertz
MM	Millimeter
TF	Turbo factor
SPSS	Statistical package for social science
SD	Standard deviation
PC	Personal computer
MB	Mamillary body
PCA	Posterior cerebral artery
RT	Right
LT	Left

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