|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
NLM (National Library of Medicine ID: 101738825)
Index Copernicus Value 2018: 75.71
Original Research Article
Volume 4, Issue 6; June: 2020; Page No. 147-149

TO ANALYZE THE SENSITIVITY OF DIFFUSION WEIGHTED IMAGING (AT HIGHER B VALUE, IN DIFFERENT IMAGING PLANES AND COMPARISON WITH ADC, FLAIR, T2W IMAGING).

Dr. Vivek Kumar[1], Dr. Deepika Meena[2], Dr. G.L. Meena[3]
[1] Resident Doctor, [2] Senior resident, [3] Senior Professor & HOD
[1-3]Department of Radio-Diagnosis, Sardar Patel Medical College & Associate Group of PBM Hospitals, Bikaner (Rajasthan)
[2]Department of Dental, Sardar Patel Medical College & Associate Group of PBM Hospitals, Bikaner (Rajasthan)

Article Info: Received 17 May 2020; Accepted 17 June 2020
DOI: https://doi.org/10.32553/ijmbs.v4i6.1224
Corresponding author: Dr. Deepika Meena
Conflict of interest: No conflict of interest.

Abstract

Background- The danger of intracranial pathology is that expansion in an enclosed space leads to brain compression causing ischemia, swelling and loss of function that can be permanent and possibly fatal.

Methods- This was a simple observational prospective study carried out at the Department Of Radio-Diagnosis and Modern Imaging, S.P.M.C. & A.G. Of P.B.M. Hospitals, Bikaner. All the patients presented for MR brain study with some neurological complaints and showed positive findings on MRI were included in this study.

Results-Mean ADC value in different type of intracranial lesions and found that abscess had mean ADC value of 0.35±0.11, acute arterial infarcts had 0.44±0.11, ADEM had 0.38±0.06, encephalitis had 0.38±0.04, glioma had 0.47±0.02, HIE had 0.36±0.03, ICH had 0.58±0.17, lymphoma had 0.52±0.15, meningioma had 0.61±0.16, metastasis had 0.51±0.03, subacute arterial infarct had 0.44±0.11, TBM had 0.48±0.05 and diffuse axonal injury, pontine myelinolysis and venous infarct had mean ADC value was 0.43, 0.52 and 0.42 respectively

Conclusion- The diffusion weighted MR images should be interpreted along with other sequences and also along with clinical details of the patient.

Keywords: MRI, Brain, lesion.

Introduction

The danger of intracranial pathology is that expansion in an enclosed space leads to brain compression causing ischemia, swelling and loss of function that can be permanent and possibly fatal. Seizures greatly increase the cerebral metabolic rate for oxygen. They are also associated with regional ischemia that can lead to cell death and loss of cognitive and functional abilities. Compromised integrity of the membranes covering the CNS (e.g. meningomyelocele) presents a significant risk for infection, as well as cerebrospinal fluid loss and hypothermia[(1)].

Intracranial lesions can occur in all age groups. In children, intracranial lesions are common in posterior fossa region. MRI and Diffusion weighted imaging help us in classification and characterization of the lesions. With advent of DWI and its ADC values, the diagnosis, classification, characterization and location of the lesion is made more precise and accurate[(2)].

DWI is one of the important sequences in neuroimaging. Basically, it is a T2W sequence with which diffusion sensitizing gradients are used. The gradients applied sensitizes to even minute diffusion of water molecules in the tissue. In pathological tissues, the diffusion of water molecules is restricted and it is detected on imaging as hyperintense signal on DWI and corresponding drop on ADC maps[(3)].

MATERIALS AND METHODS

Source of Data:

This was a simple observational prospective study carried out at the **DEPARTMENT OF RADIO-DIAGNOSIS AND MODERN IMAGING, S.P.M.C. & A.G. OF P.B.M. HOSPITALS, BIKANER.** All the patients presented for MR brain study with some neurological complaints and showed positive findings on MRI were included in this study.

Study Area:

Department of Radio-Diagnosis and Modern Imaging, S.P.M.C. & A.G. of P.B.M. Hospitals, Bikaner.

Sample Size:

The study group consisted of 150 patients.

Duration of Study:

12 Months from August 2018 to July 2019.

Inclusion Criteria:

- All patients presented with neurological symptoms and with findings on DWI.
- Both indoor and outdoor cases were included across all age groups, gender and religion etc.

Exclusion Criteria:

- Patients with no findings on DWI.

Technique and Tool:

The study involves obtaining axial DWI images with b values 0 to1000. In some patients, when required, coronal images with same b values and additional axial images with b value 0 to 2000 were also obtained.

Machine: PHILIPS ACHIEVA 1.5 TESLA MRI.

Coil: Head matrix coil.

Scan parameters:

TR	3400
TE	102
Number of averages	4
Section thickness	5 mm
Pixel bandwidth	964 HZ/Px
FOV	230
b value	0, 1000, 2000

Sequences:

DWI sequences with above mentioned parameters is used with automated reconstruction of ADC maps in axial planes. In some patients when necessary images in coronal planes were also obtained. Other conventional MRI sequences like axial T1, T2, FLAIR were also obtained.

Data Collection:

The indication, clinical findings, prior imaging findings and DWI findings of all patients were recorded and DICOM images were saved in CD format for future reference. Follow up and final diagnosis were obtained by appropriate lab investigations and histopathological correlations whenever available.

Statistics applied:

The obtained data was assessed as per the different demographic groups and diagnosis. The observations depending on the differences on ADC values are made.

OBSERVATIONS

Table 1: Age wise distribution of study group

Age group	No. of cases	Percentage
0-10years	8	5.3
11-20years	7	4.67
21-30 years	6	4
31-40 years	6	4
41-50 years	18	12
51-60 years	27	18
61-70 years	40	26.67
71-80 years	24	16
81-90 years	12	8
>90 years	2	1.33
Total	150	100
Mean±SD	56.7±2.19	

Here, majority of patients (26.6%) were from age group 61-70 years followed by 18% from age group 51-60 years, 16% from 71-80 years, 8% from 81-90 years, 5.3% were less than 10 years, 4.67% from 11-20 years, 4% from 21-30 and 31-40 years each and 1.3% patients were having age greater than 90 years. The mean age of patients was 56.7±2.19 years.

Table 2: Gender wise distribution of study group

Gender	No. of cases	Percentage
Male	96	64
Female	54	36
Total	150	100

The present study included 96(64%) males and 54(36%) females with male to female ratio of 1.78:1.

Table 3: Distribution of cases according to MRI diagnosis

Diagnosis		No. of cases	%
Stroke (120)	Subacute arterial infarct	76	50.67
	Acute arterial infarct	33	22
	ICH	6	4
	HIE	4	2.67
	Venous infarct	1	0.67
Tumors (17)	Meningioma	9	6
	Lymphoma	4	2.67
	Glioma	2	1.3
	Metastasis	2	1.3
Infections (9)	TBM	4	2.67
	Abscess	3	2
	Encephalitis	2	1.3
Others (4)	ADEM	2	1.3
	Pontine myelinolysis	1	0.67
	Diffuse axonal injury	1	0.667
Total		150	100

Here, out of total 120 stroke cases, there were 33 cases of acute arterial infarct, 4 of HIE, 6 cases of ICH, 76 of subacute arterial infarct and 1 case of venous infarct. Similarly, out of total 17 cases of tumors, 9 cases were of meningioma, 4 of lymphoma, 2 of glioma and metastasis each. Out of total 9 cases of infections, there were 3 cases

of abscess, 2 of encephalitis and 4 of tubercular meningitis. There were 1 case of pontine myelinolysis, 2 cases of ADEM and 1 cases of Diffuse axonal injury in this study.

Table 3: Mean ADC value in different Intracranial lesions.

Intracranial Lesion	Mean ADC value b = 1000	SD
Abscess	0.35	0.11
Acute arterial infarct	0.44	0.11
ADEM	0.38	0.06
Diffuse axonal injury	0.43	0
Encephalitis	0.38	0.04
Glioma	0.47	0.02
HIE	0.36	0.03
ICH	0.58	0.17
Lymphoma	0.52	0.15
Meningioma	0.61	0.16
Metastasis	0.51	0.03
Pontine myelinolysis	0.52	0
Subacute arterial infarct	0.44	0.11
TBM	0.48	0.05
Venous infarct	0.42	0

Here, we calculated mean ADC value in different type of intracranial lesions and found that abscess had mean ADC value of 0.35±0.11, acute arterial infarcts had 0.44±0.11, ADEM had 0.38±0.06, encephalitis had 0.38±0.04, glioma had 0.47±0.02, HIE had 0.36±0.03, ICH had 0.58±0.17, lymphoma had 0.52±0.15, meningioma had 0.61±0.16, metastasis had 0.51±0.03, subacute arterial infarct had 0.44±0.11, TBM had 0.48±0.05 and diffuse axonal injury, pontine myelinolysis and venous infarct had mean ADC value was 0.43, 0.52 and 0.42 respectively.

Discussion

Diffusion weighted MRI provides image contrast that is different from that provided by conventional MRI sequences. It provides a technique for mapping proton contrast that reflects the microvascular environment. This imaging technique is sensitive to early ischemic insult. DWI is performed with a pulse sequence capable of measuring water translation over short distances. This water diffusion is much slower in certain pathological conditions as compared with normal brain.

Diffuse axonal injury (DAI) and cortical contusions constitute the vast majority of primary intra-axial lesions in cases of traumatic brain injury. DWI is potentially useful and sensitive in diagnosing the lesions in diffuse axonal injury, but GRE images are best.

Amon Y. Liua et al[(4)] showed in their study that decreased ADC can be demonstrated in patients with DAI in the acute setting and may persist into the subacute period.

In our study we found only one patient with history of fall and having diffuse axonal injury. The patient showed multiple high intensity signals on DWI and low signal on ADC map. The mean ADC value of DAI was 0.43.

Conclusion

The diffusion weighted MR images should be interpreted along with other sequences and also along with clinical details of the patient.

References

1. Wells L. Complication in Anesthesia. 2nd Edition, 2007, Elsevier.
2. Jyothi JSA, Hari PS, V. Karuna. Role of diffusion weighted imaging in intracranial tumors with pathological correlation. International Journal of Contemporary Medical Research. 2016 Feb;3(2):559-63.
3. Amiri Z, Boldaji YM and Nazarlou AK. Evaluation of the Accuracy of Diffusion-weighted Imaging (DWI) in Differentiating Primary Brain Lymphoma (PBL) of Glial Tumors. American Journal of Medical Case Reports. 2018;6(5):92-98.
4. Amon Y. Liu, Joseph A. Maldjian, Linda J. Bagley, Grant P. Sinson and Robert I. Grossman.. Traumatic Brain Injury: Diffusion-Weighted MR Imaging Findings. AJNR. 1999 Oct;20(9):1636-41.