

Role of MRI in differentiation of Acute Disseminated Encephalomyelitis from Multiple Sclerosis

Shalu Mishra, Sumeet Bhargava

Assistant Professor, Rama Medical College Hospital and Research Centre,
Delhi, Hapur Road, NH - 24, Uttar Pradesh, India

ABSTRACT

- Background:** The differentiation between Acute disseminated Encephalomyelitis(ADEM) and Multiple sclerosis(MS) is of utmost importance from clinical prognostic view - point. The different imaging modalities are available; however, MRI plays significant role in prognosis. ADEM is monophasic acute inflammation and demyelination of white matter following recent viral infection or vaccination. Clinical presentation consistent with ADEM can also be the first manifestation of multiple sclerosis (MS), Particularly in children. MS in most patients is a long-lasting chronic disease, characterised by relapses, which may finally transform into a progressive disease. Symptoms unlike MS are more symptomatic rather than focal and include fever and multifocal neurological symptoms. ADEM is considered a disease caused by immune responses of the brain after a severe viral, bacterial or parasitic infection. It can also occur after vaccination MRI can also be helpful in differentiating ADEM from MS. Indistinct lesion borders, gray matter involvement, and diffuse or multilesional enhancement all favor the radiologic diagnosis of ADEM over MS also ADEM have diffuse bilateral lesion Pattern whereas MS have unilateral lesion pattern. ADEM lesions tend to resolve or remain unchanged with no new lesion formation, whereas appearance of new lesion is common in MS.
- Method :** Retrospective analysis of MRI scans of 18 children diagnosed with MS and 10 children with ADEM was performed T-2/FLAIR hyperintense lesions were categorised according to location, description, number and size. T1W1 before and post gadolinium administration were evaluated for the presence of lesion and post gadolinium enhancement. MRI findings were compared between the groups. Exclusion criteria is patient with orbit tumour and patient with implant.
- Results:** ADEM was seen in children <10 years (M=F) MS >10 years (M<F). History of prior infection was very frequent in ADEM whereas variable in MS. MRI findings to distinguish MS from ADEM are absence of diffuse bilateral lesion pattern, Presence of two or more periventricular lesions. However lesion margin are poorly defined (fuzzy) in ADEM and well defined (Dawson finger) in MS. Post-gadolinium shows patchy/absent enhancement in ADEM and focal enhancement in MS. On followup studies ADEM lesions are resolved whereas MS shows new lesions.
- Conclusion:** MRI is useful in differentiating patient with first attack of MS from those with Monophasic ADEM.

Key words: ADEM, MS, MRI

Abbreviations: ADEM - Acute disseminated Encephalomyelitis, MS - Multiple sclerosis

Address for correspondence

Shalu Mishra, Rama Medical College Hospital and Research Centre,
Delhi, Hapur Road, NH - 24, Uttar Pradesh - 2453304 India
Phone: 99999368311
Email: drshalumishra@gmail.com

Received: 06.11.15

Accepted: 27.02.16

Introduction

The differentiation between Acute disseminated Encephalomyelitis (ADEM) and Multiple sclerosis (MS) is of utmost importance from clinical prognostic significance. The different imaging modalities are available however MRI plays significant role in prognosis. ADEM is monophasic acute inflammation and demyelination of white matter following recent viral

infection or vaccination.[8] Clinical presentation consistent with ADEM can also be the first manifestation of multiple sclerosis (MS), Particularly in children. MS in most patients is a long-lasting chronic disease, characterised by relapses, which may finally transform into a progressive disease. [7]

Patients of ADEM, unlike MS are more symptomatic and include fever and multifocal neurological symptoms. ADEM is considered a disease caused by immune responses of the brain after a severe viral, bacterial or parasitic infection. It can also occur after vaccination [3][4] MRI can also be helpful in differentiating ADEM from MS. Indistinct lesion borders, gray matter involvement, and diffuse or multilesional enhancement all favor the radiologic diagnosis of ADEM over MS [9] also ADEM have diffuse bilateral lesion Pattern whereas MS have unilateral lesion pattern [6] and ADEM lesions tend to resolve or remain unchanged with no new lesion formation, whereas appearance of new lesion is common in MS. [8]

Aim and Objective

1. Role of MRI in differentiation of ADEM from MS
2. Role of Diagnostic differentiation between ADEM and MS for prognostic reason

Method and Material

Retrospective analysis of MRI scans of 18 patients diagnosed with MS and 10 patients with ADEM. T-2/FLAIR hyperintense lesions were categorised according to location, description, number and size. T1W1 before and post-gadolinium administration were evaluated for the presence of lesion and post-contrast enhancement. Exclusion criteria is patient with orbit tumour and patient with implant.

RESULT

It was observed that 8/10 patients diagnosed as ADEM, were < 10 years age whereas 2 patients were between 20 to 35 years. 15/18 patients diagnosed as MS were female and between 20 to 50 years Whereas 3/18 patients were male between 50 to 70 years. History of prior infection was very frequent in ADEM whereas variable in MS. 11/18 patients diagnosed as MS had bilateral optic neuritis whereas 3/18 patients had unilateral optic neuritis and 4/18 patients had no findings of optic neuritis on MRI Scan. On MRI scan 9/10 patients diagnosed as ADEM had diffuse bilateral lesion Pattern whereas 1/10 had unilateral lesion. 10/18 patients diagnosed as MS had unilateral lesion pattern whereas 8/18 patients had diffuse bilateral lesion pattern. 7/18 patients diagnosed as MS had lesions in periventricular

region 5/18 patients had lesions in corpus callosum region 3/18 patients had lesions in infratentorial region located at surface of pons and at the base of fourth ventricle 2/18 patients had multifocal basal ganglion lesion 1/18 patient had cortical infarct lesion. 6/10 patients diagnosed as ADEM had lesion in basal ganglia and 4 /10 lesion were seen in thalamus location. On MRI scan 16/ 18 patients diagnosed as MS had well defined lesion (dawson finger) whereas 2/18 patients had illdefined margins. 7/ 10 patients diagnosed as ADEM had poorly defined (fuzzy) margin whereas 3/10 lesions had well defined margins. On followup MRI 8/10 patients diagnosed as ADEM had no lesions whereas 2/10 lesion remain unchanged with formation of no new lesions. 11/ 18 patients diagnosed as MS showed formation of new lesions 7/18 lesions remain unchanged.



Fig. 1: Case of Multiple Sclerosis



Fig. 2: Case of Multiple Sclerosis



Fig. 3: Case of Multiple Sclerosis



Fig. 4: Case of Multiple Sclerosis

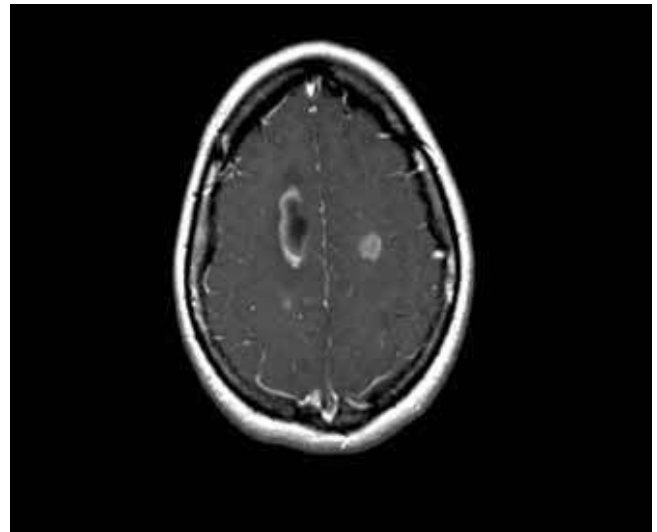


Fig. 6: Case of MRI ADEM



Fig. 5: Case of MRI ADEM

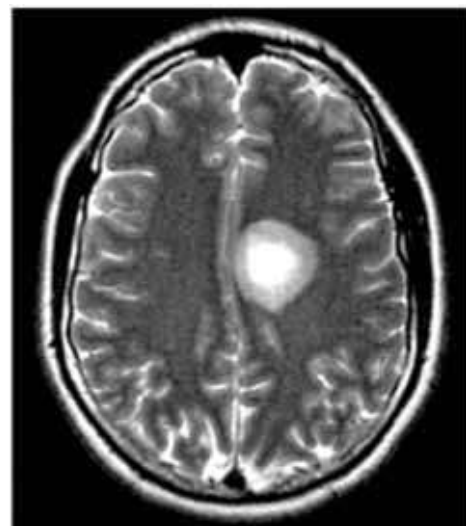


Fig. 8: Case of MRI ADEM



Fig. 6: Case of MRI ADEM

Discussion

In our study 8/10 patients diagnosed as ADEM were less than 10 years whereas 2/10 patients between 20 to 35 years; age distribution was similar to that reported by Marchioni E et al [1] which states ADEM is common in children and rare in adults. In present study 15/18 diagnosed as MS are females between 20 to 50 years whereas 3/18 patients were male between 50 to 70 years which is similar to Balcer L.C et al [2] in which MS was seen commonly in females between 15 to 49 years. History of prior infection was very frequent in ADEM whereas variable in MS which is similar to Schwarz S et al [3] and de seze J et al [4] study in which 73 percentage reported a recent infection or vaccination. 11/18 MS patients have bilateral optic neuritis 3/18 have unilateral optic neuritis 4/18 patients have no finding of optic

neuritis which is similar to Frohman EM et al study. [5] On MRI scan 9/10 patients diagnosed as ADEM have diffuse bilateral lesion Pattern whereas 1/10 patient had unilateral lesion. 10/18 patients diagnosed as MS have unilateral lesion pattern whereas 8/18 patients have diffuse bilateral lesion pattern which is similar to study of Callen DJ et al [6] in which ADEM lesions had diffuse bilateral pattern mostly whereas MS lesions showed unilateral pattern. 7/18 MS lesion are located in periventricular region 5/18 lesions are located at corpus callosum 3/18 lesions in infratentorial region located at surface of pons and at base of 4th ventricle 2/18 lesions are multi focal basal ganglia lesions 1/18 are cortical infarct. 6/10 lesions of ADEM are located in basal ganglia and 4/18 lesions are located at thalamus. Which is similar to study of Polman CH et al [7] which states MS lesions are common in periventricular region, corpus callosum and infratentorial region and ADEM lesions are common in basal ganglia and thalamus. In present study 16/18 MS lesions are well defined (Dawson finger) whereas 2/18 lesions are ill defined. 7/10 ADEM lesions have poorly defined margins whereas 3/10 lesions have well defined margin which is similar to Polman CH et al [7] Which states ADEM has mostly indistinct lesion border whereas MS has well defined Dawson finger appearance. In present study on follow up MRI 8/10 patients diagnosed as ADEM had no lesions whereas in 2/10 lesions remained unchanged with formation of no new lesions. 11/18 MS lesions showed formation of new lesions 7/18 lesions remain unchanged which is similar to Wingerchuk DM et al [8] study which states ADEM lesions tend to resolve or remain unchanged with no new lesion formation, whereas appearance of new lesion is common in MS.

Conclusion

In most but not all cases, ADEM occurs only once, while patients with MS have, repeated attacks of inflammation in their brains. In most cases, ADEM patients do not develop new scars on a repeat MRI scan whereas MS patients typically experience new scars on their follow-up MRI scans. Typical symptoms of ADEM such as fever, headache and confusion, vomiting, and seizures are not usually seen in people with MS, although they can be seen in paediatric MS onset especially in patients younger than 11 years. Pattern of MRI abnormalities helps in differentiating these two disorders. Most patients with MS are treated with ongoing medication to prevent attacks. Patients with ADEM do not require such medication. ADEM occurs more frequently in males; MS more frequently in females. ADEM is more common in children; MS is more common in adults.

Conflict of interest:	All authors declare no COI
Ethics:	There is no ethical violation as it is based on voluntary anonymous interviews
Funding:	No external funding
Guarantor:	Dr Shalu Mishra will act as guarantor of this article on behalf of all co-authors.

References

1. Martini E, Marinou-Aktipi K, Uggetti C, et al: Effectiveness of intravenous immunoglobulin treatment in adult patients with steroid-resistant monophasic or recurrent acute disseminated encephalomyelitis. *J Neurol* 2002;249:100-104.
2. Balcer L J. Clinical practice. Optic neuritis. *N Engl J Med* 2006; 354:1273 .
3. Schwarz S, Mohr A, Knauth M, et al: Acute disseminated encephalomyelitis: A follow-up study of 40 adult patients. *Neurology* 2001;56:1313-1318.
4. de Seze J, Debouverie M, Zephir H et al. Acute fulminant demyelinating disease: A descriptive study of 60 patients. *Arch Neurol* 2007;64:1426-1432.
5. Frohman EM, Goodin DS, Calabresi PA, et al. The utility of MRI in suspected MS: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology*. 2003;61:602-611.
6. Callen DJ, Shroff MM, Branson HM, Li DK, Lotze T, Stephens D, et al. Role of MRI in the differentiation of ADEM from MS in children. *Neurology* 2009;72:968-73.
7. Polman CH, Reingold SC, Edan G, et al: Diagnostic criteria for multiple sclerosis: 2005 Revisions to the "McDonald Criteria." *Ann Neurol* 2005;58:840-846.
8. Wingerchuk DM, Lucchinetti CF: Comparative immunopathogenesis of acute disseminated edencephalomyelitis, neuromyelitis optica, and multiple sclerosis. *Curr Opin Neurol* 2007;20:343-350.
9. Canellas AC, Gols AR, Izquierdo JR, et al: Idiopathic inflammatory-demyelinating diseases of the central nervous system. *Neuroradiology* 2007;49:393-409.

