



Radiological evaluation of multiple sclerosis in patients of different age groups in a subset of Pondicherry population

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Abstract

Objective: To evaluate the distribution of lesions in Multiple Sclerosis (MS) patients of different age groups on their initial MRI scan in a subset of Pondicherry population.

Methods: We retrospectively reviewed cases with clinical features raising suspicion of Multiple Sclerosis but with no confirmatory diagnosis. They were referred for the initial imaging studies to department of radiodiagnosis in our institute for further evaluation. These patients were then followed up to look for dissemination of lesions in space and time before confirming the final diagnosis of Multiple Sclerosis. The current study is a comprehensive collection of these cases on their first presentation of imaging features that were consistent with Multiple Sclerosis. We evaluated the extent of lesions in these patients of different age groups using MRI.

Results: In our retrospective study conducted with the sample of 30 cases of Multiple Sclerosis over the period of 4 years between 2017-2021, the most common age group of presentation was in between 20-40 years of age followed by 40-60 years and the least age group of presentation being less than 20 years. MS was most common in females than in males with M:F ratio being (1:2). The extent of lesions also varied based on age groups and the most affected area showed T2/FLAIR hyperintense lesions in the periventricular and juxta cortical regions in all age groups.

Keywords: multiple sclerosis, magnetic resonance imaging, specific location and extent of lesions based on various age groups

Introduction

Multiple sclerosis is an auto immune disease of the central nervous system characterized pathologically by demyelination of white matter and radiologically by an area of focal hyperintensity on a T2/FLAIR or Proton density (PD)-weighted sequence [1, 2, 3]. Magnetic resonance imaging (MRI) is the best initial and most accurate method for confirming the diagnosis of Multiple Sclerosis. The prevalence of MS in Indian population is approximately 8 in 100000 and is much lower than that of in white population of European and North American ancestry [4, 5]. Multiple sclerosis lesions typically develop in both hemispheres, but their distribution is often mildly asymmetric in the early stages [6, 7, 8, 9]. While lesions can occur in any CNS region, relative to other disorders that cause white matter lesions, Multiple Sclerosis lesions tend to affect specific white matter regions, such as the periventricular and juxtacortical white matter, the corpus callosum, infratentorial areas (especially the pons and the cerebellum) and the spinal cord (preferentially the cervical segment) [10, 11, 12]

Materials and methods

This is a descriptive study of retrospectively reviewed cases of MS in 30 patients with proven or almost certain aetiologies, who were referred for MRI study to Department of Radio-diagnosis in our hospital during the period of 2017 to 2021. All the patients of various age groups included in this study were imaged in our institution and have been evaluated for the extent of lesions in

MS. MRI was done using Siemens 1.5 T Magnetom Essenza MRI scanner.

Imaging Features

MRI has proven to be the “The Gold Standard” for the radiological evaluation of Multiple Sclerosis with Multi-Planar Imaging using T2/FLAIR, T1, ADC, DWI, post-contrast. Sequences. McDonald’s criteria is routinely used to confirm the clinical diagnosis. A lesion in multiple sclerosis is seen as an area of focal hyperintensity on a T2-weighted (T2, T2-FLAIR or similar) or a proton density (PD)-weighted sequence. Typical Multiple Sclerosis lesions are round to ovoid in shape and range from a few millimetres to more than one or two centimetres in diameter.

Discussion

Age group and gender

It’s been mostly prevalent in the age groups of 20-40 years and the extent of lesions varied based on the age group of presentation, with the youngest being at 15yrs and the eldest presentation at 58 years.

Dissemination in Space

This is a retrospective study conducted over period of 4 years in 30 patients taking into consideration all age groups and both sexes. The results obtained are as follows - In the age group of less than 20 years, we found 8 patients showing hyperintense

lesions in periventricular, cortical or juxta cortical and infratentorial regions. Of around 13 patients between age group 20-40 years showed hyperintense lesions predominantly in periventricular, juxtacortical, infratentorial and spinal cord regions mainly at the cervicothoracic level. 9 patients in the age group between 40-60 years showed hyperintense lesions predominantly in periventricular and juxta cortical regions.

Table 1: Showing distribution of lesions in different age groups at the time of initial presentation.

Age Group	Distribution
< 20 years	Periventricular, Juxtacortical and Infratentorial
20-40 Years	Periventricular, Juxtacortical, Infratentorial and Spinal cord
>40 years	Periventricular and Juxtacortical

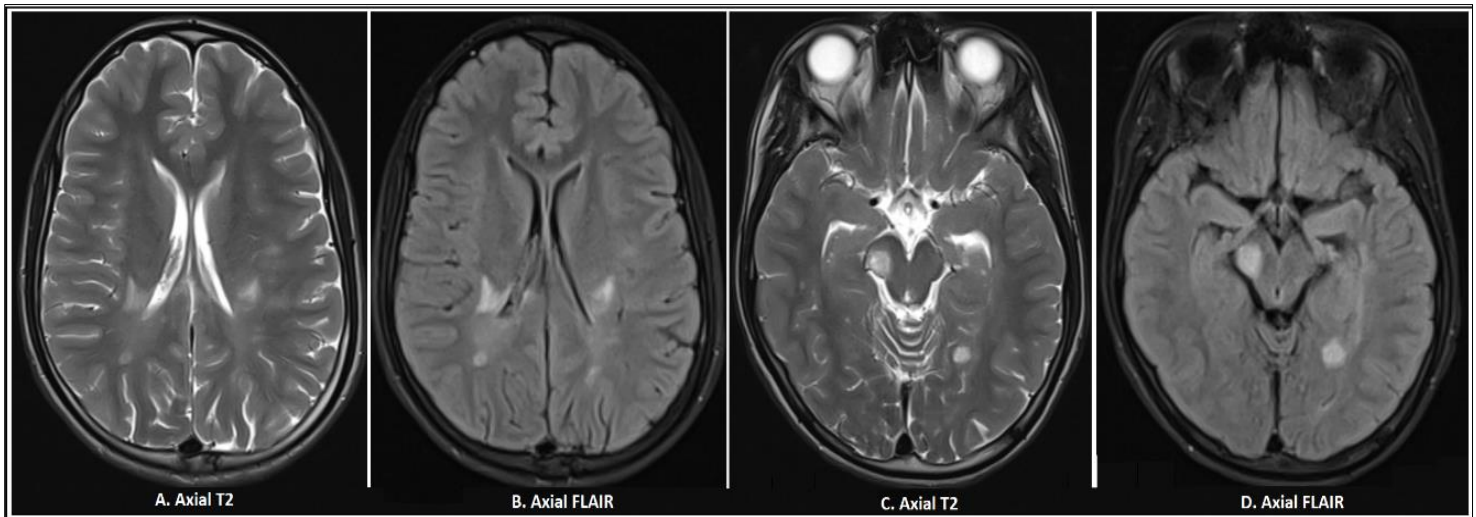


Fig 1: 15 Year old male with clinical suspicion of multiple sclerosis show multiple shows multipal nodular T2/ flair hyperintensities in bilateral periventricular and subcortical white matter of both cerebral hemispheres and in brainstem

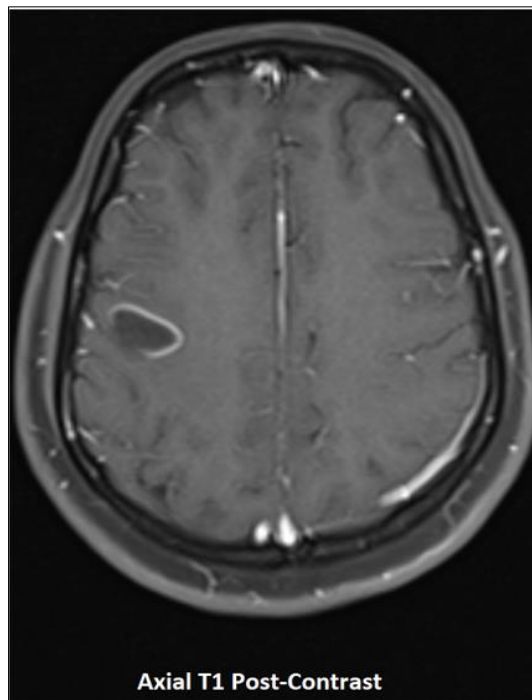


Fig 2a: 22 year old female with clinical suspicion of multiple sclerosis shows thin-walled cystic lesion with open-ring enhancement in right high frontal region.



Fig 2a: 22 year old female with clinical suspicion of multiple sclerosis shows multiple ill-defined T2 hyperintense lesions at C3-C4 and CS levels

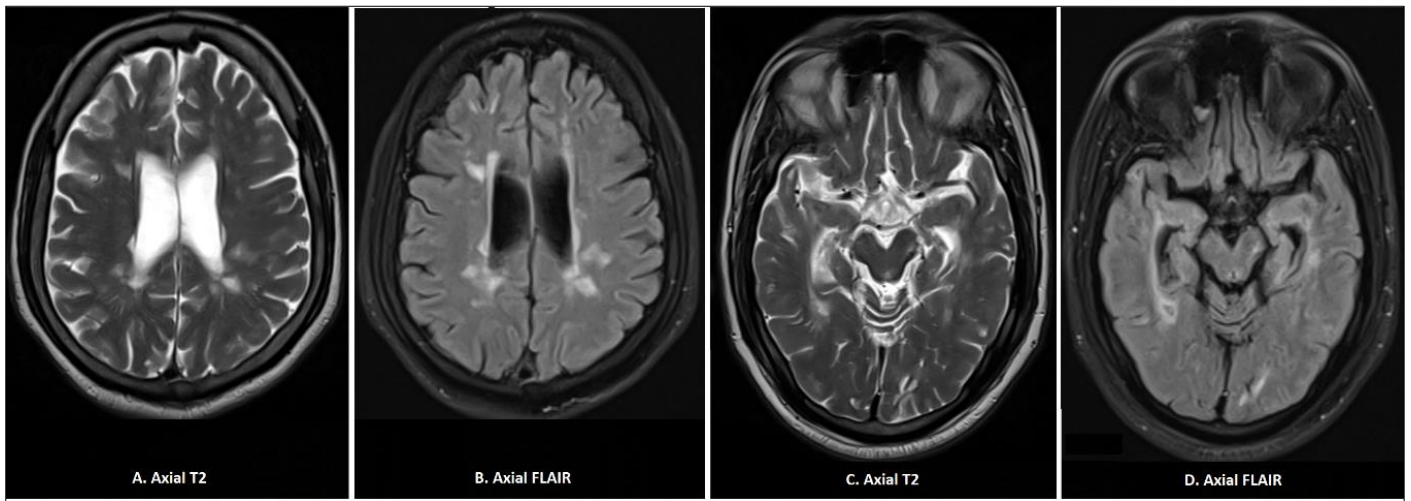


Fig 3: 38Year old male with clinical suspicion of multiple sclerosis showing multiple shows multiple nodular T2/ flair hyperintensities in periventricular region and in brainstem

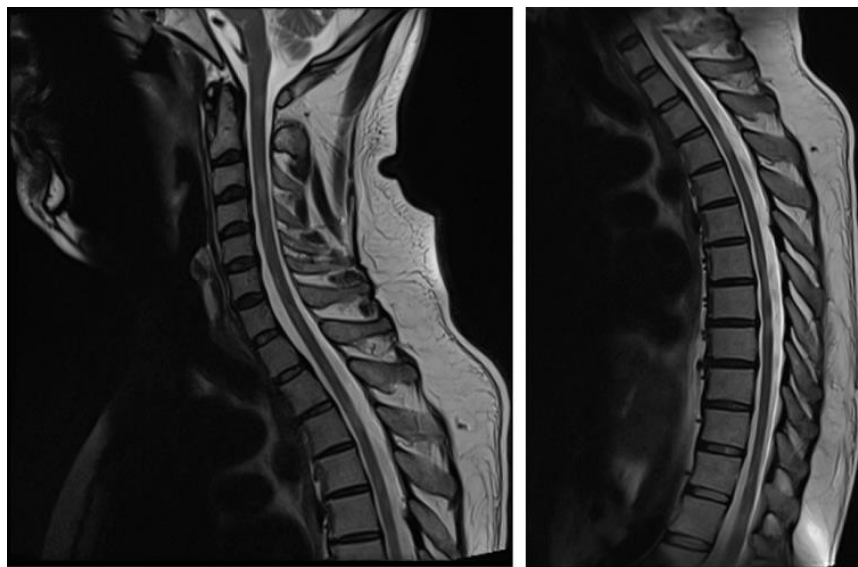


Fig4: 38yr old male with clinical suspicion of multiple sclerosis shows multiple ill-defined nodular T2 hyperintense lesions noted in the cervico-thoracic spine cord C2 level C3- C4 level, D3 level, and at D7 and D8 level.

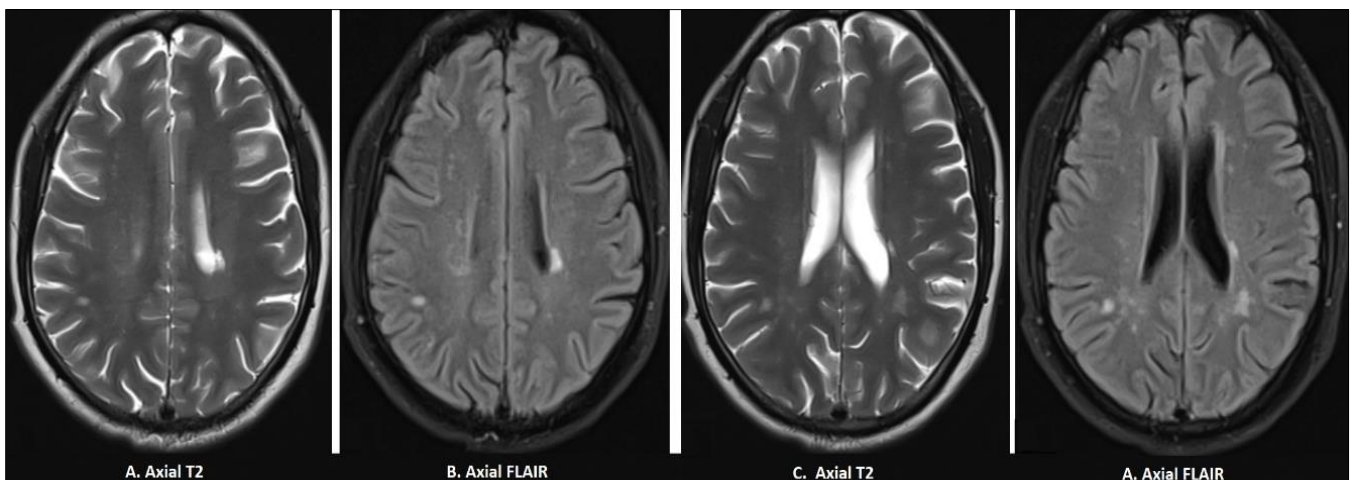


Fig 5: 43Year old male with clinical suspicion of multiple sclerosis shows multiple nodular T2/ flair hyperintensities in bilateral periventricular and subcortical white matter

Conclusion

Among all the 30 patients studied retrospectively, the ratio varied between males and females (M: F-1:2), the disease being more common in females comparatively to that in males. The age group more commonly found was in between 20-40 years with the ratio of 30% in females and 20% in males, followed by 40-60years -20% in females and 10% in males and with the least cases found in less than 20 years of age of about 13% in females and 6% in males. The extent of lesions noted also varied based on age group of presentation. In this study in all the age groups, the most commonly presented and certainly affected location revealed T2/FLAIR hyperintense lesions in the periventricular and juxta cortical areas. Besides patients in age group of 20-40 years also showed hyperintense lesions in the infratentorial and spinal cord regions, whereas few patients with age group less than 20 years additionally showed lesions in the infratentorial region.

References

- Li T, Xiao H, Li S, Du X, Zhou J. Multiple sclerosis: clinical features and MRI findings in Northern China. *Eur J Med Res*. Published,2014;19(1):20. doi:10.1186/2047-783X-19-20
- Filippi M, Preziosa P, Banwell BL, Barkhof F, Ciccarelli O, De Stefano N *et al*. Assessment of lesions on magnetic resonance imaging in multiple sclerosis: practical guidelines. *Brain*.2019;142(7):1858-1875. doi: 10.1093/brain/awz144. PMID: 31209474; PMCID: PMC6598631.
- ktas O, Wattjes MP, Stangel M, Hartung HP. Diagnose der Multiplen Sklerose: Revision der McDonald-Kriterien [Diagnosis of multiple sclerosis: revision of the McDonald criteria 2017]. *Nervenarzt*. 2018 Dec, German,2017;89(12):1344-1354.. doi: 10.1007/s00115-018-0550-0. PMID: 29876600.
- Geraldes R, Ciccarelli O, Barkhof F, De Stefano N, Enzinger C, Filippi M *et al*. Palace J; MAGNIMS study group. The current role of MRI in differentiating multiple sclerosis from its imaging mimics. *Nat Rev Neurol*,2018;14(4):199-213. doi: 10.1038/nrneurol.2018.14. Epub Mar 9. Erratum in: *Nat Rev Neurol*,2018;14(4):213. PMID: 29521337
- Sheldon JJ, Siddharthan R, Tobias J *et al*. MR imaging of multiple sclerosis: comparison with clinical and CT examinations in 74 patients. *AJR Am J Roentgenol*,1985;145(5):957-64.
- Polman CH, Reingold SC, Banwell B, Clanet M, Cohen JA, Filippi M *et al*. Diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald criteria. *Ann Neurol*,2011;69:292-302
- Barkhof F. The clinico-radiological paradox in multiple sclerosis revisited. *Curr Opin Neurol*,2002;15:239-45.
- Wattjes MP, Harzheim M, Lutterbey GG, Hojati F, Simon B, Schmidt S *et al*. Does high field MRI allow an earlier diagnosis of multiple sclerosis? *J Neurol*,2008;255:1159-63.
- Gass A, Rocca MA, Agosta A, Ciccarelli O, Chard D, Valsasina P *et al*. MAGNIMS Study Group. MRI monitoring of pathological changes in the spinal cord in patients with multiple sclerosis. *Lancet Neurol*,2015;14:443-54.
- Geurts JJ, Calabrese M, Fisher E, Rudick RA. Measurement and clinical effect of grey matter pathology in multiple sclerosis. *Lancet Neurol*,2012;11:1082-92.
- Filippi M, Rocca MA, Calabrese M, Sormani MP, Rinaldi F, Perini P *et al*. Intracortical lesions: relevance for new MRI diagnostic criteria for multiple sclerosis. *Neurology*,2010;75:1988-94.
- De Graaf WL, Kilsdonk ID, Lopez-Soriano A, Zwanenburg JJ, Visser F, Polman CH *et al*. Clinical application of multi-contrast 7-T MR imaging in multiple sclerosis: increased lesion detection compared to 3 T confined to grey matter. *Eur Radiol*,2013;23:528-40.