

VARIATION IN REGIONAL DISTRIBUTION OF MULTIPLE SCLEROSIS PLAQUES IN PAKISTANI AND CANADADIAN NATION

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Abstract

Background and Purpose: To determine retrospectively the variation in regional involvement of brain among established cases of MS Canadian and Pakistani nation. We also analyzed parahippocampal gyrus lesions with further characterization according to grey white matter distribution.

Methods: Sixty patients presenting clinically with multiple sclerosis were included as two groups of thirty each from Canadian and Pakistani nation respectively. Imaging was performed on 1.5 T MR system acquiring T₁W, T₂W, Proton density, FLAIR and T₁W post gadolinium sequences. Lesions were counted and classified according to anatomic regions paraventricular, temporal lobe and juxtacortical. The juxtacortical involvement of parahippocampal region considering brain parenchymal involvement were classified.

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Results: Canadians had more disease load as compared to Pakistani nation. Mean age of the patients are relatively younger in Canadians however anatomical lesional distribution in temporal lobe, paraventricular and parahippocampal region more or less same.

Conclusion: Multiple sclerosis is more common among Canadian however its lesional anatomical distribution including parahippocampal region had no significant variation.

Keywords: Multiple sclerosis (MS), Periventricular (PVC), Temporal lobe, Juxtacortical (JC) and Parahippocampal.

Introduction

Multiple sclerosis is the most common central nervous system chronic inflammatory disease in young adults affecting white and gray matter. It can lead to severe and irreversible clinical disability. Magnetic resonance imaging is basically used to diagnose and monitor the progression of the disease even in clinical isolated syndrome of multiple sclerosis and its prediction of disability and brain atrophy.

MR imaging in the diagnosis of multiple sclerosis is performed using multisequence protocol including T₂ – weighted, Fluid – attenuation inversion recovery (FLAIR), Proton density, precontrast and postcontrast T₁ – weighted sequences. There is different sensitivity

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level among sequences of MR in differentiation of supratentorial and infratentorial lesions. Dual – echo (DIR) and FLAIR imaging have a high sensitivity for detection of MS lesions, which appear as focal areas of hyperintensity on these types of images.

However there is lack of specificity in DIR and FLAIR sequences in differentiation of various lesions particularly edema, demyelination and remyelination, inflammation and gliosis.

Different longitudinal and cross sectional studies shows relationship of the grey matter atrophy and cognitive impairment but involvement of the parahippocampal gyrus and its diagnosis with particular MR sequence is still point to be considered. In this study we focus on involvement of the parahippocampal gyrus in multiple sclerosis and variations in signals change according the disease stage. Further we also compare involvement of the temporal lobe with special consideration to its cognitive effect, between Canadian and Pakistani nationals.

Methods

Patients

We examined 60 patients in two groups of 30 Canadian and Pakistani nation with clinically definite MS.

Statistical Analysis

Table 1: Ethnic variation among Pakistani and Canadian nations with regional involvement of brain in established cases of Multiple sclerosis.

		Pakistani Patients (n = 30)	Canadian Patients (n = 30)
Age		32 (16 – 65) Years	29 (15 – 16) Years
Gender	Male	15	10
	Female	15	20
Distribution of Lesion in Temporal Lobe			
Total Lesion		210	286
PVC		90	136
JC		102	121
PHG		18	29

Chi-Square Test = 1.957, p-value = 0.375 (Insignificant: p-value > 0.05)

Table 2: Parahippocampal distribution in established cases of Multiple sclerosis among Canadian and Pakistani population.

Chi-Square=0.509, p-value=0.775 (Insignificant: p-value>0.05)

	PHG	
	Pakistani Patients	Canadian Patients
White matter	8 (44.44%)	10 (34.48%)
Grey White (Mixed)	7 (38.89%)	14 (48.28%)

Canadian having 20 women, 10 men; mean age is 29 years; range, 15 – 60 years. Their median disease duration was 7 years (range, 3 – 12 years), 17 patients had RRMS, 6 had secondary progressive MS (SPMS), and 7 had primary progressive MS (PPMS).

Pakistani 30 patients having, 15 women, 15 men; mean age is 32 years; range, 16 – 65 years. Their median disease duration was 5 years (range 2 – 12 years), 14 patients had RRMS, 10 had secondary progressive MS (SPMS), and 6 had primary progressive MS (PPMS).

MR Image Acquisition

In each subject, brain MR images were obtained at study entry by using the 1.5 – T MR units. In each patient we performed 5 sequences including dual – echo turbo spin – echo imaging (TR/TE, 3300/16 and 98 echo train length and T₁ – weighted conventional spin – echo imaging (768/15), T₂ – weighted, FLAIR and proton density imaging. Twenty – four contiguous axial sections were acquired with 5 – mm section thickness, a 256 × 256 matrix, and 250 × 250 mm field of view. The sections were positioned to run along the medial temporal lobe in coronal, axial and saggittal planes to localize parahippocampal lesions.

Grey matter	3 (16.67%)	5 (21.42%)	18	29
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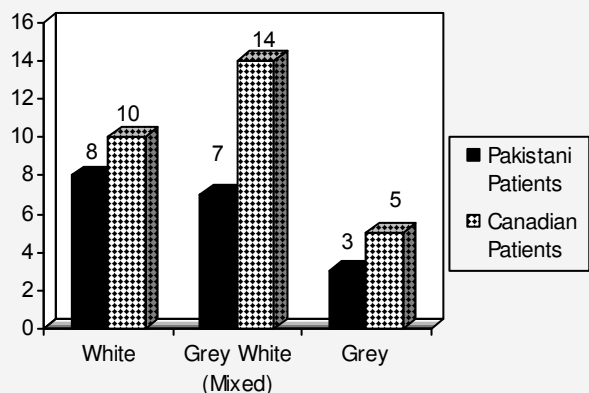


Figure 1: Graphical presentation of Parahippocampal distribution in established cases of Multiple sclerosis among Canadian and Pakistani population.

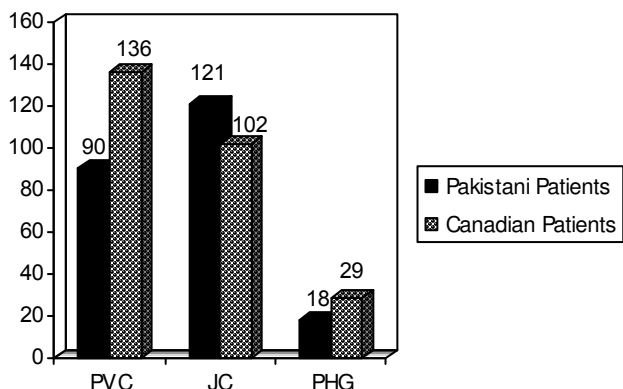


Figure 2: Graphical representation of Ethnic variation among Pakistani and Canadian nations with regional involvement of brain in established cases of Multiple sclerosis.

MR Image Analysis

Each MR image sequence was analyzed and total number of lesions were counted. Further characterization these temporal lobe lesions distribution in to periventricular, juxtacortical and parahippocampal regions. In parahippocampal lesions we also analyzed grey and white matter or mixed distribution.

Results

We summarize, findings from MR imaging studies of Multiple Sclerosis of 30 Canadian patients showing (n = 286) total numbers of lesions, in temporal lobe

including n = 136 number of lesions (47.55%), in Periventricular (PVC) n = 121 (42.30%) in Juxta cortical n = 29 (10.13%) in Para Hippocampal gyrus (PHG) of Temporal Lobe.

Among (n = 29), total number of PHG lesions, n = 14 Ls (48.27%) were from mixed lesions of PHG (grey and white matter), (n = 10) Ls (34.48%) from white matter of PHG lesions and (n = 5 (17.24%) gray matter of PHG lesions.

Among all PHG lesions, there were 4 LS (13.79%) were acute lesions in its characteristic.

On the other hand among 30 Pakistani establish cases of multiple sclerosis (n = 210) total numbers of lesions, in Temporal lobes including n = 102 number of lesions (48.57%), in Periventricular (PVC) n = 90 (42.85%), in Juxta cortical (JC) n = 18 (8.57%) in Para Hippocampal gyrus (PHG) of Temporal Lobe.

Among (n = 18), total number of PHG lesions, n = 7 Ls (lesion) (38.88%) were from mixed lesions of PHG (grey and white matter), (n = 8) Ls (44.44%) from white matter of PHG lesions and (n = 3 (16.67%) gray matter of PHG lesions.

Among all PHG lesions, there were 5 Ls (27.78%) were acute lesions in its characteristic.

Discussion

Conventional MR sequences are still widely used for diagnosis of Multiple sclerosis in the presence of newer techniques like MR spectroscopy and diffusion tensor imaging.¹⁻⁴

In the last decade Fluid inversion recovery sequences (FLAIR) has become part of imaging guide lines and protocol for inflammatory brain lesion such as multiple sclerosis because of better detection of supratentorial juxtacortical and periventricular white matter brain lesions.^{5,6} Newer technique such as double inversion recovery imaging established recently because of much better attenuation of both white matter lesion and CSF.⁷ The diagnostic accuracy DIR sequence is focused in clinical applications of neuroimaging including infectious, inflammatory, vascular and neoplastic lesions by two major studies. DIR sequences has drawback of long acquisition time although the results of these studies regarding infratentorial brain pathologies were quite promising.^{5,8} In parahippocampal lesions in addition to the conventional T₁W, T₂W and Flair sequence, DIR and proton density sequences have signifi-

cant appreciating results. Multiple sclerosis lesions in parahippocampal gyrus can be detected by lower mag-



netic field strength 1.5 T as compare to higher sensitive MR imaging using high field strength 3T.⁹⁻¹¹



Figure 3: Acute left hippocampal lesion.

FLAIR and DIR sequences have difference of detection rates between juxtacortical white matter and mixed gray-white matter distribution of multiple sclerosis lesions. DIR detect higher numbers of mixed gray – white matter lesions.⁵ Since recently performed histopathologic studies revealed that intracortical lesions are frequently observed in MS patients, the detection of those intracortical lesions is becoming increasingly important and is therefore of diagnostic and prognostic interest.¹²

Two studies approved the racial difference in involvement of multiple sclerosis including one study on American and Caucasians and other study on blacks and whites respectively. Though this study do not support the theory that blacks have a lower risk of multiple sclerosis than whites because of possibility of lower vitamin D level but this would not explain why Hispanics and Asians have a lower risk of Multiple sclerosis than whites or why the higher risk of MS among blacks was found only among women.^{13,14} Our study has the same results that favour the more common involvement of Canadians as compare to Pakis-

tani. Our study also depict that womens predominance in involvement of multiple sclerosis.

Conclusion

Mutliple sclerosis is more common among Canadian females however disease anatomical distribution including parahippocampal region having no significant variation.

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