Original Research Paper

Volume-9 | Issue-6 | June-2019 | PRINT ISSN No. 2249 - 555X

Radiodiagnosis

UTILITY OF MRI IN DIAGNOSIS OF OF POSTERIOR REVERSIBLE ENCEPHALOPATHY SYNDROME (PRES) IN POST PARTUM FEMALES

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ABSTRACT **Aim:** Our purpose is to characterize MRI, and diffusion-weighted imaging (DWI) findings in pregnant patients who were identified clinically to have PRES. We study the conversion of reversible vasogenic edema to irreversible cytotoxic edema and predict the progression to infarction.

Material and methods: 44 post partum females, aged between 20 and 46 years and with neurological manifestations had undergone conventional MRI, diffusion weighted image study, and ADC map.

Results: Lesions were mainly affecting the parieto-occipital regions, symmetrical or slightly asymmetrical distribution of the lesions in both cerebral hemispheres was found in most cases. The MRI findings in all the twenty two patients were: abnormal low SI in T1 WI, abnormal high SI on T2 and FLAIR WI. In DWI, hyperintensity with hyperintensity in ADC map was seen in 15 patients, hyperintensity with hypointensity in ADC map in 4 patients, normotensive in DWI with hyperintensity in ADC map in 3 patients.

Conclusion: The diagnosis of PRES has important therapeutic and prognostic value. The use of diffusion-weighted imaging and ADC maps allows an earlier and clearer differentiation of cytotoxic and vasogenic edema, which can predict the development of infarction.

KEYWORDS : DWi , edema , FLAIR , pregnancy , PRES

INTRODUCTION

Posterior reversible encephalopathy syndrome (PRES) is a potentially devastating neurologic syndrome characterized by rapidly progressive signs and symptoms, including headache, seizures, consciousness disturbance, and/or visual disturbance (1). Extensive white-matter changes suggestive of posterior cerebral edema are also present. This syndrome was first named reversible posterior leukoencephalopathy syndrome, but it has also been known by many other names including PRES, hyper-perfusion encephalopathy, brain capillary leak syndrome, and hypertensive encephalopathy (2). Eclampsia as well as several other pathologic entities which include severe hypercalcemia, thrombocytopenic syndromes, Henoch-Scho¨nlein purpura, hemolytic uremic syndrome, amyloid angiopathy, systemic lupus erythematous, acute glomerulonephritis, various causes of renal failure, acute intermittent porphoria and immunosuppressive medications such as cyclosporine, and various anti neoplastic agents may result in the Aposterior reversible encephalopathy syndrome (PRES) (3). This syndrome is a variant of hypertensive encephalopathy, both hypertensive encephalopathy and PRES can arise from an acute elevation in blood pressure that overcomes the myogenic vasoconstriction of cerebral arteries and arterioles causing loss of autoregulatory capacity, BBB disruption, and vasogenic edema (4). The difference between hypertensive encephalopathy and PRES is that PRES can develop without a significant elevation in blood pressure (5). It is not entirely known why PRES favors the posterior circulation, but this may arise from a relative lack of sympathetic innervations at the level of the arterioles supplied by the vertebrobasilar system compared with the anterior circulation; this innervation presumably protects the brain from marked increases in intravascular pressure, such as with severe hypertension. PRES is not an entirely posterior phenomenon, but rather appears in a gradient-like fashion from posterior to anterior, presumably reflecting the gradient of sympathetic innervations (6).

MATERIAL AND METHODS

This prospective study was done between February 2018 and July 2018 with 44 post partum females with their age ranged between 20 and 46 years and with neurological manifestations, 36 patients (81.8%) presented with elevated blood pressure above 140/90 mmHg and 8 patients (18.1%) were normotensive. 40 patients (90%), complained of headache, 22 patients (50%) of seizures, decreased consciousness in 34 patients (77%), nausea and vomiting in 26 patients (59%), coma in 8 patients (27%) and loss of vision in 8 patients (18%), Table 1. All patients underwent complete neurological examination. MRI examination was done for all patients using GE signa-1.5 Tesla. Informed consent was obtained from all patients.

All the 44 patients were examined by; axial T1 weighted (TR/TE: 450/10 ms), T2 weighted (TR/TE:3881/ 120 ms), and FLAIR (TR/TE/TI:6000/110/2000 ms). DW imaging was done using an echo planar imaging (EPI) sequence (TR/TE: 5381/81 ms); slice thickness: 5 mm and the apparent diffusion coefficient (ADC) map were done, 3D time of flight magnetic resonance angiography (3D–TOF–MRA) (TR/TE: 40/3.5) was done to ensure the vascular normality in PRES.

RESULTS

According to the hypertensive status 36 patients (81.8%) were hypertensive and 8 patients (18.1%) were normotensive, (table 2).

PRES lesions were typically located in the territories of the posterior circulation, mainly in the parieto-occipital in 36 patients (81.82%), and posterior temporal region with white matter predominance, frontal region in 4 patients (9.09%), midbrain in 4 patients (9.09%), basal ganglia in 8 patients (18.18%), cerebellum in 8 patients (18.18%), and in the thalamus in 4 patients (9.09%) (Table 3). Symmetrical or slightly asymmetrical distribution of the lesions in both cerebral hemispheres was found in most cases, except in one patient who had a lesion mainly over the right cerebral hemisphere. The MRI findings in all the 44 patients were: abnormal low SI in T1 WI, abnormal high SI on T2 and FLAIR WI.

In DWI, hyperintensity was seen with no restriction and hyperintensity in ADC map due to T2 shine through phenomenon in 30 patients (68.18%), hyperintensity in DWI with hypointensity in ADC map due to infarction was seen in 8 patients (18.1%), , and normotensive in DWI with hyperintensity in ADC map was seen in 6 patients (13.63%), (Table 4).

Follow up of 10 cases by MRI and diffusion study showed complete resolution with disappearance of hyperintensity.

Table 1 Clinical presentations of the patients.

Clinical symptoms	No.	%
Headache	38	95
Decreased consciousness	34	85
Nausea and vomiting	32	80
Seizure	26	65
Coma	16	40
Loss of vision	12	30
	X^2 value 29.744	**P-value <0.001**

Table 2 Classification of patients according to blood pressure

	N0	%
Hypertensive	32	80
Normotensive	8	20
Total	40	100
Chi-Square	4.225	
p-value	**0.039**	

Table 3 The location of PRES.

Location of abnormal SI	No.	%
Occipto-parietal	32	80
Frontal	4	10
Mid brain	6	15
Basal ganglia	2	5
Cerebellum	2	5
Thalamus	2	5
Chi square	**18.500**	
p-value	**0.0024**	

Table 4 The diffusion findings.

Chi-square	DWI	ADC MAP	No.	%
-	Hyperintene	Hyperintene	30	75
-	Hyperintene	Hypointene	6	15
	Normo	Hypointene	4	10
X^2	**3.273**	**0.074**	-	-
p-value	**1.455**	**0.227**	-	-

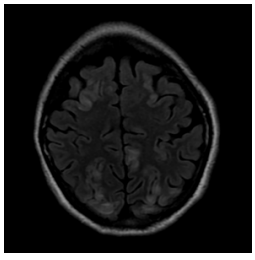

Figure.1: Gyral hyperintensity is noted involving bilateral fronto –parietal lobe in a post partum lady presented with seizures.

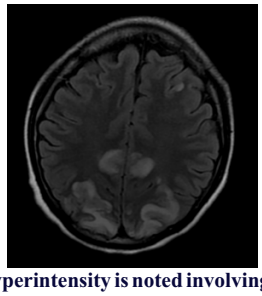

Figure.2: Gyral hyperintensity is noted involving bilateral parietal lobe in a post partum lady presented with persisting vomiting.

DISCUSSION

Pregnancy and post partum status can precipitate new neurological diseases as a result of the alteration in physiology , the post partum patient presenting with neurological problems poses both diagnostic and therapeutic challenges, often forcing the clinician to rely on neuroimaging as part of the work up (7). In our study 36 patients were hypertensive and 8 patients were normotensive but all had the clinical and radiological manifestations of PRES, as in Miza (5) and Hosley and McCullough (8) study in which they found that PRES can develop without a significant elevation of blood pressure. Also in Chou et al (1) study markedly elevated blood pressure was noted in most patients at initial presentation, they have observed that some patients have only mildly elevated or even normal blood pressure. Patients with PRES often have non localizing neurologic symptoms and signs, such as headache, seizure, consciousness disturbance, and/or visual dysfunction. Seizure may be the first neurologic symptom, headache and abnormalities of visual function such as blurred vision or transient blindness are also frequent complaints (1). In our study the most common clinical manifestation was headache which was present in 40 patients followed by decreased consciousness in 34 patients, and seizures in 22 patients. The clinical findings are often nonspecific, so the diagnosis may be difficult to establish. This was in agreement with Brewer et al. (2) in which the headache was present in 87% of cases and visual disturbance in 34%.

The most common MRI abnormality in PRES is brain edema, mainly in the white matter in the posterior portions of the cerebral hemisphere in the parieto-occipital region. The edema may extend to the adjoining gray matter (9). In our study, the most common affected site was the parieto-occipital. region-consistent with the findings of others (2) – which was present in 36 patients (81.82%) . The other regions of the cerebral hemispheres affected were the frontal region (9.09%), midbrain (9.09%), basal ganglia (18.18%), cerebellum (18.18%), and thalamus in (9.09%) Fig. 2.

Symmetrical or slightly asymmetrical distribution of the lesions in both cerebral hemispheres was found in 42 cases, only one patient had a lesion mainly over the right cerebral hemisphere. Conventional MRI shows decreased signal intensity in T1WI, increased SI in T2WI and FLAIR WI in all cases as in Zidan and Hindawy (6) study.

In diffusion study hyperintensity in DWI with hyperintensity in ADC map in 30 patients (68.18%) was explained to be due to vasogenic edema (T2 shine through phenomenon and not due to true restriction of diffusion), and hyperintensity in DWI with hypointensity in ADC map was seen in 8 patients (18.1%) denoting the presence of cytotoxic edema and development of ischemic infarction with irreversible tissue damage as a common complication of PRES . These results were in agreement with those of Chou et al. (1), Zidan and Hindawy (6), Covarrubias et al. (10), Watanbe et al. (11) and Koch et al. (12). In three cases (13.63%), the diffusion was normotensive with hyperintensity in ADC map, this occurs due to severe vasogenic edema, in Covarrubias et al. (10) and Watanbe et al. (11) study they noticed that the cytotoxic edema developed immediately adjacent to the area with elevated ADC value.

CONCLUSION

The diagnosis of PRES has important therapeutic and prognostic value. The use of diffusion-weighted imaging and ADC maps allows an earlier and clearer differentiation of cytotoxic and vasogenic edema, which can predict the development of infarction.

Conflict of interest

We have no conflict of interest to declare.

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