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Clinical study

Posterior reversible encephalopathy syndrome (PRES): Is DWI a prognosis factor?

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ABSTRACT

Introduction: Posterior reversible encephalopathy syndrome is a clinicoradiologic entity with typical MR imaging showing a white matter vasogenic edema predominantly affecting the occipital and parietal lobes of the brain. The aim of this article is evaluated the importance of DWI as a prognosis factor in patients with PRES.

Materials and methods: We reviewed data from 70 patients with PRES (35 with restricted DWI and 35 with no DWI abnormalities), that were admitted to Hospital São Lucas-PUCRS. These two groups were evaluated in age, sex, previous diseases and past medical history, use of medications, the neurologic manifestations, the highest blood pressure during the neurologic presentation and the highest creatinine during the period of observation.

Results: Evaluating 70 patients with PRES with a mean age of 25.4 years old (range from 2 to 74 years old; 55 female and 15 male) we identified 35 cases were brain MRI presents with restricted DWI. Restricted DWI was associated with higher mortality in 90 days (14.2% vs 0.0%; p: 0.027).

Conclusions: Few articles present new data that will help clinicians in therapeutic decisions or that modify the knowledge of this syndrome. We suggested that restricted DWI is associated with a worst prognosis in PRES.

1. Introduction

Posterior reversible encephalopathy syndrome (PRES) is a clinicoradiologic entity characterized by headaches, altered mental status, seizures, and visual loss and is associated with white matter vasogenic edema predominantly affecting the occipital and parietal lobes of the brain [1]. The cause of PRES is not yet understood. Autoregulatory dysfunction, as suggested in hypertensive encephalopathy, is often cited as the underlying mechanism. On the other hand, vasospasm with ischaemic change is also observed in some patients [2,3].

Several factors can trigger the syndrome, most commonly: acute elevation of blood pressure, abnormal renal function and immunosuppressive therapy [1]. Other possible etiologies are eclampsia, transplantation, neoplasia and chemotherapy treatment, systemic infections, acute or chronic renal disease [4–7].

The most common imaging pattern in PRES is the presence of edema in the white matter of the posterior portions of both cerebral hemispheres, especially the parieto-occipital regions, in a relatively symmetric pattern [1]. However, other structures (such as the brain stem, cerebellum, and frontal and temporal lobes) may also be involved, and although the abnormality primarily affects the subcortical white matter, the cortex and the basal ganglia may also be involved [8].

DWI most commonly does not show abnormalities in the region of vasogenic edema as demonstrated on T2-weighted imaging or FLAIR images. However, although referred to as a reversible process, restricted diffusion have been described in 26% of patients with PRES [9]. The importance of DWI in the evaluation of patients with PRES is unclear.

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The aim of this article is investigate if DWI alterations can be a prognosis factor in patients with PRES.

Methods

We reviewed data from 70 patients with PRES (35 with restricted DWI and 35 without DWI abnormalities), that were admitted to the Neurology Service of Hospital São Lucas-PUCRS (Brazil) or that were assisted in other units of the same hospital by our service from December 2010 to December 2017. It is an observational study, which includes all patients with diagnosis of PRES of Neurology Service of our hospital. The patients underwent a brain magnetic resonance image (MRI): 65 patients (92.8%) were submitted to two brain MRI; and the other five patients realized only one exam. The following data was evaluated: age, sex, previous diseases and past medical history, the neurologic manifestations and the neuroimage alterations in brain MRI.

The highest blood pressure was measured during the 48 h before the neurologic manifestation and the highest creatinine was analyzed during a mean period of two week before the neurologic manifestation. All the brain MRI were analyzed by a neurologist and a radiologist, who had no contact with the patient's clinical data. We analyzed the data using the Statistical Package for the Social Sciences (SPSS). We applied Chi-square test or Exact Fischer test for comparing data with non-parametic distribution and the Student *t* test for comparison of means. A p value <0,05 was considered significant. All of the procedures and protocols were approved by the Institutional Ethics Committee from Pontifícia Universidade Católica do Rio Grande do Sul.

Table 1
Clinical Differences between Restricted and Normal DWI patients.

	Restricted DWI	Normal DWI	P
N	35	35	–
Age (yo)	25,1 ± 8,1	25,7 ± 7,9	0.754
Sex - Female (%)	82,8	74,2	0.382
Symptoms	–	–	–
Headache	30	29	0.743
Seizure	21	16	0.231
Visual disturbance	29	22	0.060
Alteration of mental status	19	12	0.092
Topography	–	–	–
Occipital	33	33	1.000
Parietal	19	16	0.473
Frontal	11	8	0.420
Temporal	10	8	0.584

Table 2
Mortality, Disability and Recurrence between Restricted and Normal DWI patients.

		Restricted DWI	Normal DWI	p
Death	Yes	5	0	0,027
	No	30	35	
Recurrence	Yes	1	0	1,000
	No	34	35	
Persistent Disability	Yes	2	0	0,493
	No	33	35	

2. Results

Evaluating 70 patients with PRES with a mean age of 25.4 years old (range from 2 to 74 years old; 55 female and 15 male) we identified 35 (50%) cases were brain MRI presents with restricted DWI. The most common cause of PRES in our serie was disorders related to pregnancy (33 cases) following by hypertensive status due to renal lesion (12), lupus (5) and chemotherapy (4). Headache was the most common symptom (84.4%) following by visual changes (73.4%), seizure (53.1%) and alteration of mental status (43.8%). Comparing patients with abnormalities or no-abnormalities DWI there were no differences between the two groups (Table 1).

The most common loci of lesion were occipital lobe (94.2%), following by parietal lobe (50%), frontal lobe (27.1%) and temporal lobe (25.7%). Evaluating the patients 90 days after the diagnosis of PRES, five patients died, two persists with severe neurologic symptoms (visual deficits or seizures) and one had recurrence of PRES. All patients who died, had persistent symptoms or recurrence are of the group of restricted DWI (Table 2).

3. Discussion

Since 1985, neuro-radiologic findings had been described in the presence of eclampsia and other pregnant dysfunctions [10]. After its first description in 1996, many papers were published; however the precise pathophisiological mechanism remains unclear [1].In 2000, Casey et al. proposer the term Posterior Reversible Encephalopathy Syndrome [11]. The majority of current literature about PRES is based in case reports, few articles present new data that will help clinicians in therapeutic decisions or that modify the knowledge of this syndrome.

In a previous paper of our group, we described that the involvement of anterior zones of brain is associated with higher blood pressure. Patients that present PRES only in posterior zones had less systolic blood pressure and a better prognosis. These differences probably occur due to a leak of cerebral autoregulation in posterior zones, because of the larger number of autonomic receptors in the carotid artery in comparison to the vertebral-basilar system [12].

The extent of imaging severity in PRES showed significant association and correlation with hemorrhage and cytotoxic edema [13]. Previous papers reportd that in patents with PRES submitted to brain MRI, the ADC values were consistently elevated compared with those in normal control subjects [14].

Evaluating 35 patients with PRES, Hiremath et al described an association between the image pattern and the presence of hemorrhage. The extent of imaging severity in PRES showed significant association and correlation with hemorrhage and cytotoxic edema [15].

Two previous papers evaluated the relation between DWI alterations and prognosis of patients with PRES [16–17]. Covarrubias et al described that a high DWI signal intensity and pseudonormalized ADC values are associated with cerebral infarction and may represent the earliest sign of nonreversibility as severe vasogenic edema progresses to cytotoxic edema [16]. However, evaluating 36 patients, Wagih et al didn't idenfied any radiological differences that could modify the prognosis [17].

In summary, we suggested that restricted DWI is associated with a worst prognosis in PRES. New prospective studies are needed to elucidate the correlation with DWI in PRES and to describe the correct pathophysiological mechanisms, that remains unclear.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jocn.2019.12.023.

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