OBSTETRICS

Posterior reversible encephalopathy syndrome in 46 of 47 patients with eclampsia

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OBJECTIVE: We sought to investigate the concurrence of posterior reversible encephalopathy syndrome (PRES) with eclampsia and to describe the obstetric, radiological, and critical care correlates.

STUDY DESIGN: This was a single-center, 2001-2010 retrospective cohort study of all patients with eclampsia who underwent neuroimaging via magnetic resonance imaging (MRI) or computerized tomography (CT) with or without contrast.

RESULTS: Forty-six of 47 of eclamptic patients (97.9%) revealed PRES on neuroimaging using 1 or more modalities: MRI without contrast, 41 (87.2%); MRI with contrast, 27 (57.4%); CT without contrast, 16 (34%); CT with contrast, 7 (14.8%); and/or magnetic resonance angiography/magnetic resonance venography, 2 (4.3%). PRES was identified within the parietal, occipital, frontal, temporal, and basal ganglia/brainstem/cerebellum areas of the brain. Eclampsia occurred antepartum in 23 patients and postpartum in 24 patients. Headache was the most common presenting symptom (87.2%) followed by altered mental status (51.1%), visual disturbances (34%), and nausea/vomiting (19.1%). Severe systolic hypertension was present in 22 patients (47%).

CONCLUSION: The common finding of PRES in patients with eclampsia suggests that PRES is a core component of the pathogenesis of eclampsia. Therapy targeted at prevention or reversal of PRES pathogenesis may prevent or facilitate recovery from eclampsia.

Key words: cerebral imaging, eclampsia, posterior reversible encephalopathy syndrome

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Posterior reversible encephalopathy syndrome (PRES) was first described in 1996 by Hinchey et al.[1] In this case series of 15 patients, the authors described a condition marked by headache, altered mental status, seizures, and visual changes. These patients were also found to display extensive white-matter changes suggestive of posterior cerebral edema. This group first named this syndrome reversible posterior leukoencephalopathy syndrome, but it has also been known by many other names including PRES, hyperperfusion encephalopathy, brain capillary leak syndrome, and hypertensive encephalopathy.[1] PRES has been associated with many conditions including eclampsia, severe hypertension, autoimmune disease, treatment with cytotoxic medications, posttransplantation immunosuppression, and infection with sepsis to name a few.[2]

Generalized seizures are often the most common clinical manifestation of PRES, but patients will also present with signs of encephalopathy such as altered mental status, headaches, nausea, and vomitting.[2-4] Visual disturbances are also common, varying from mild blurry vision to complete cortical blindness.[3] Hypertension is associated with the majority of cases, although blood pressure may be normal or only mildly elevated in up to 20-30% of cases.[5] In the series of 36 patients presented by Lee et al, [3] the mean systolic blood pressure was 187 mm Hg (range, 80–240 mm Hg) within 24 hours of presentation. Laboratory findings can also vary, depending on the underlying associated condition.

Neuroimaging findings of PRES have been described in scores of eclamptic patients since the 1996 report of Hinchey et al,[1] usually in single case reports or small case series. How often PRES occurs in association with eclampsia is unknown. To our knowledge, there is no large patient series exploring the relationship between eclampsia and the concurrence of PRES. The purpose of this study was to determine what percentage of eclamptic women at our institution displayed findings of PRES when neuroimaging studies were undertaken. We also sought to determine which treatment modalities were used to manage these patients and to explore how well these interventions had an impact on overall patient outcome.

Materials and Methods

This project was a single-center, retrospective cohort study inclusive of the years 2001-2010, which was approved by the institutional review board at the University of Mississippi Medical Center. Inclusion criteria were pregnancy or within 6 weeks' postpartum; neuroimaging via magnetic resonance imaging (MRI) or MRI and/or magnetic reso-

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TABLE 1
Patient demographics based on when seizure occurred

Demographic	Antepartum, n (%) (n = 23)	Postpartum, n (%) (n = 24)	*P* value
Maternal race			.729
African American	19 (83)	19 (79)	
White	3 (13)	4 (17)	
Hispanic	1 (4)	1 (4)	
Maternal age, y	21.21 ± 4.56	22.37 ± 6.97	.506
Maternal BMI, kg/m^2	31.36 ± 10.07	27.46 ± 6.61	.143
Gravida			.777
Nulliparous	12 (52)	13 (54)	
Multiparous	11 (48)	11 (46)	
Gestational age, wks	31.7 ± 4.44	36.6 ± 4.83	.002
Mode of delivery			.001
Vaginal	6 (26%)	16 (67%)	
Cesarean section	17 (74%)	8 (33%)	
HTN (systolic), mm Hg			.001
<140	4 (17)	4 (17)	
140-159	10 (44)[a]	7 (29)	
160-180	6 (26)	13 (54)[b]	
>180	3 (13)[c]	0 (0)	
Days in-house	5 ± 4.01	2.79 ± 2.41	.026

BMI, body mass index; *HTN*, hypertension.

[a] Significant compared with women with postpartum eclampsia; [b] Significant compared with women with antepartum eclampsia; [c] Significant compared with women with postpartum eclampsia.

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nance angiography (MRA) and/or computerized tomography (CT) performed during hospitalization; and diagnosis of eclampsia. Exclusion criteria included not being pregnant or longer than 6 weeks postpartum; no diagnosis of eclampsia; MRI or MRA neuroimaging not performed during hospitalization; diagnosis of cerebral hemorrhage; known seizure disorder; and later diagnosis of seizure from a source other than eclampsia.

We investigated all women considered to have eclampsia who underwent neuroimaging studies upon admission to our tertiary care referral hospital. Cases to be investigated were determined based on a discharge diagnosis of eclampsia. The appropriate charts were collected, and the women who underwent neuroimaging were selected for study. The majority of these patients underwent imaging within the first 24 hours after admission. The medical records of patients with eclampsia who underwent cranial imaging were identified, evaluated, and pertinent data extracted. If neuroimaging was not undertaken for an eclamptic patient, no further data accrual was undertaken.

Imaging analysis

The imaging modalities used included MRI, MRA, and CT both with and without contrast. The diagnosis of PRES was made by radiologists using the standard radiological criteria for PRES. PRES has a unique MRI and CT imaging appearance, which is demonstrated as subcortical and gyral T2-weighted and fluid attenuated inversion recovery (FLAIR) signal hyperintensities that become more diffuse as the extent of edema increases. Focal areas include symmetric multilobar/hemispheric edema with predominant involvement of parietal and occipital lobes. In addition, frontal lobes and the inferior temporal-occipital junction are also focal areas, less commonly the cerebellum.[5] This group of women included both antepartum and postpartum eclampsia.

Statistical analysis

Maternal race, gravida, mode of delivery, systolic hypertension, imaging modality, site of lesions, and treatment modality was analyzed via a χ^2 analysis. Maternal age, body mass index (BMI), gestational age at delivery, days in-house, and the time to return to normalcy were analyzed using a Student *t* test. Data are expressed as mean ± SD. A $P < .05$ was considered significant.

RESULTS

Forty-seven of 123 women considered to have eclampsia (38.2%) underwent neuroimaging studies during the 10 year period of 2001-2010 at our academic institution. The findings from all 47 patients who underwent neuroimaging are reported in the current study. Among the 47 study subjects were 23 women with antepartum eclampsia and 24 women with postpartum eclampsia. In cases of postpartum eclampsia, on average, the patient experienced her first seizure on day 6 (range, 0–14 days).

There was not a significant difference in self-reported maternal ethnicity between women with antepartum and postpartum eclampsia ($P = .729$; Table 1). Neither were there any significant differences in maternal age ($P = .506$), maternal BMI ($P = .143$), or gravidity ($P = .777$; Table 1) between the 2 groups.

Women who had antepartum eclampsia primarily delivered via cesarean section (74%), whereas 67% of the women with postpartum eclampsia had vaginal deliveries ($P = .001$; Table 1). Women with antepartum eclampsia also delivered earlier than women with postpartum eclampsia ($P = .002$; Table 1) and had a longer hospital stay than women with postpartum eclampsia ($P = .026$; Table 1).

There was a significant difference in systolic pressures between women with antepartum or postpartum eclampsia ($P = .001$; Table 1). Significantly more