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Peurperal neuroimaging using MRI and MR venography

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Abstract

Aims & Objectives: To assess the role of MRI in

- The detection of the prevalence of neurological diseases in the puerperium.
- Diagnosis of various spectrums of neuroimaging patterns.
- Determining the treatment options based on the imaging findings.

Material and methods: The study included 35 patients referred to the Department of Radiodiagnosis who were in a puerperal period with neurological signs and symptoms, over a period of 10 months. All patients were subjected to MRI using 1.5T Philips Achieva MRI machine.

Results: Posterior reversible encephalopathy syndrome is the most common etiology of neurological impairment in the puerperal period. Acute onset of headache is the most common symptom responsible for positive neuroimaging findings.

Conclusion: MRI plays a very important in detection, characterization, and prognostication of neurological diseases presenting during puerperium. Post pregnancy, the majority of symptoms prove to be harmless, however in certain patients they may point to significant underlying issues. When promptly used, MRI helps in the early identification of these fatal diseases and helps reduce maternal mortality and morbidity.

Keywords: Magnetic Resonance Imaging (MRI), Neurological Disorders, Posterior Reversible Encephalopathy Syndrome (PRES), Postpartum Period.

Introduction

Pregnancy and the postpartum period bring about numerous physiological and anatomical transformations in the maternal body. Indeed, every aspect of the body adjusts to accommodate the physiological strains of pregnancy. Alterations occur in the vital organs as well as in the endocrine, hematologic, and immune systems. The central and peripheral nervous systems also undergo

modifications. Several neurological manifestations observed in pregnant individuals upon presentation could stem from ongoing physiological adjustments. Clinicians need to remain vigilant in identifying potential warning signs and promptly diagnosing neurological complications[1].

One such warning sign is development of acute headache. Post-delivery headaches are categorized into primary and secondary groups. Primary headaches constitute approximately 90% of postpartum headaches and typically encompass benign conditions such as migraines, cluster headaches, tension headaches, among others. Secondary headaches are associated with positive neuroimaging findings such as CVT, PRES, SAH etc. The postpartum period entails distinctive hormonal and physiological shifts, including heightened blood clotting tendencies and impairment of endothelial function. These elements may elevate the likelihood of secondary headaches, particularly those linked to cerebrovascular conditions[2].

Cerebrovascular complications can be categorized into five main groups: ischemic stroke, thrombosis (cortical and cerebral venous thrombosis), hemorrhage (including subarachnoid hemorrhage and posterior reversible encephalopathy syndrome), disorders related to the pituitary gland (such as pituitary apoplexy, empty/partial empty sella syndrome, and lymphocytic adenohypophysitis), and other neoplastic conditions (including primary intracranial tumors and intracranial metastasis).

Radiologists should have familiarity with cerebrovascular conditions commonly seen in young patients who are typically previously healthy. These patients often experience rapid clinical deterioration. Delay in diagnosis and treatment can significantly impact patient care for these individuals. Evaluation of these patients typically begins with unenhanced CT scans. These scans have high diagnostic accuracy in detecting hemorrhage. However, normal CT findings can lead to delayed diagnosis due to their limited ability to detect subtle white matter changes and assess the intracranial vasculature. MRI and MR angiography are both excellent diagnostic modalities for this patient population. They offer high diagnostic value without exposing patients to ionizing radiation, making them suitable as either first or second-line options.

Material and Methods

This study on "PEURPERAL NEUROIMAGING USING MRI AND MR VENOGRAPHY" has been carried out in the Department of Radio-diagnosis, Mahadevappa Rampure Medical College, Kalaburagi. A total number of 35 patients in the puerperal period with clinical and laboratory signs of neurological impairment referred to the Department of Radiodiagnosis over a period of 8 months i.e. between 1st April 2023 to 31st November 2023 were included in this study. The ethical committee approved the study protocol. All the patients gave informed consent to participate in the study.

Patients were excluded if considered unsuitable for MRI. MRI was performed by using Philips Achieva 1.5 Tesla MRI machine.

Inclusion Criteria

- Patients in puerperal period (from day of delivery to 6 weeks of delivery) presenting with various neurological impairment like headache, seizers, focal neurological deficit, altered sensorium.
- Patients in puerperal period with altered laboratory findings such as thrombocytopenia, elevated liver enzymes, microangiopathic blood smear.

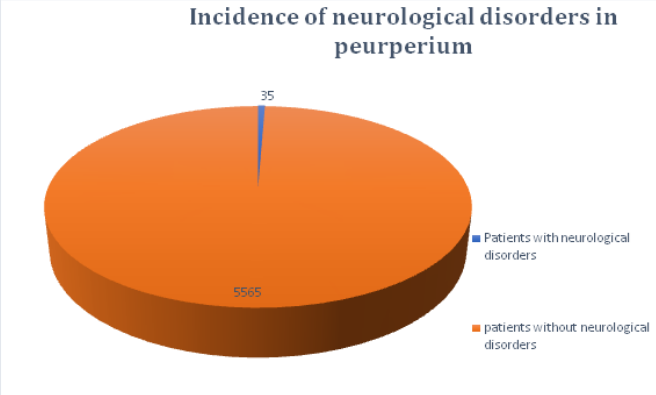
- Puerperal patients with clinical features of hypopituitarism like lactation failure, hypotension, weight loss, fatigue, behavioral abnormalities.

Exclusion criteria

- Known psychiatric disorder patients
- Known seizure disorder patients.

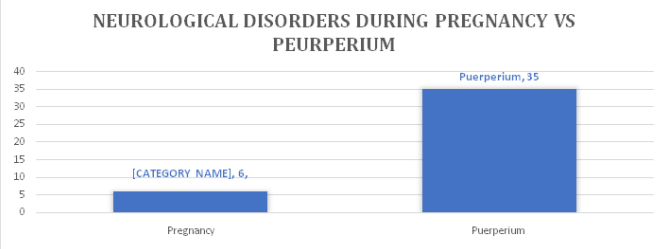
Results

Incidence: A total of 35 cases were included in our study who presented with puerperal-related neurological disorders out of 5600 deliveries that occurred in our institution during the study period. Hence, the incidence rate of neurological disorders is 625/100000 deliveries.



Neurological disorders during pregnancy vs puerperium

Period	Number of patients
Pregnancy	6
Puerperium	35

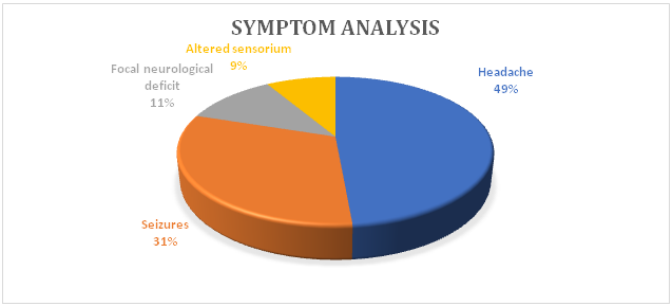


Age distribution of cases

Age group (in years)	Number of cases
18-20	5
21-30	26
31-36	4

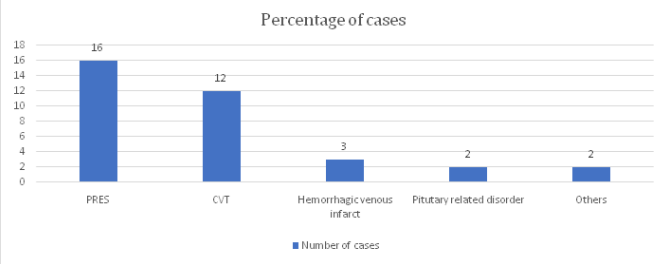
Symptom analysis

Symptoms	Number of cases
Acute headache	17
Seizures	11
Focal neurological deficit	4
Altered sensorium	3



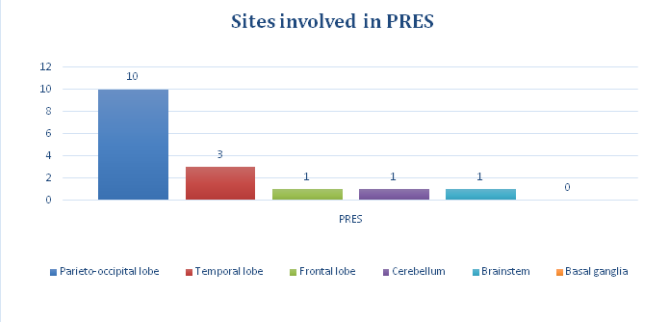
Percentage of cases

Disorder	Number of cases	Percentage
Posterior reversible encephalopathy syndrome	16	45.7%
Cerebral venous thrombosis	12	34.2%
Hemorrhagic venous infarct	3	8.5%
Pituitary related disorder	2	5.7%
Others (osmotic demyelination syndrome, SAH.)	2	5.7%



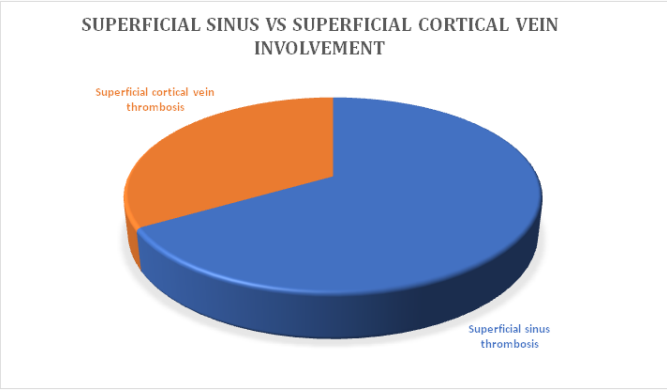
Regions involved in PRES

Regions involved	Number of cases
Parieto-occipital lobe	10
Temporal lobe	3
Frontal lobe	1
Brainstem	1
Cerebellum	1
Basal ganglia	0



Superficial sinuses vs. superficial cortical vein involvement

	Number of cases	Percentage
Superficial sinus	8	66.6%
Superficial cortical vein	4	33.3%



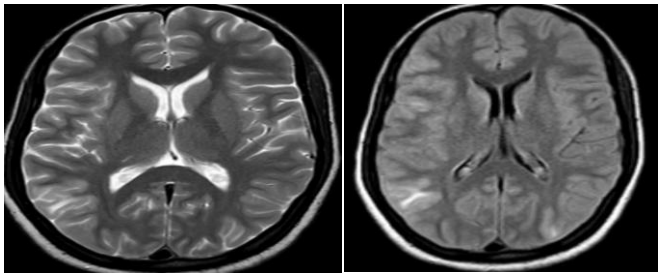


Figure 1: Axial T2/FLAIR images shows cortical and subcortical edema in bilateral posterior parietal region.

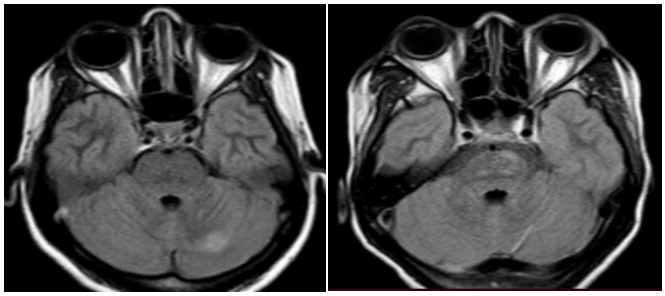


Figure 2: Axial FLAIR images show edema involving left cerebellum and brainstem, suggesting Atypical PRES

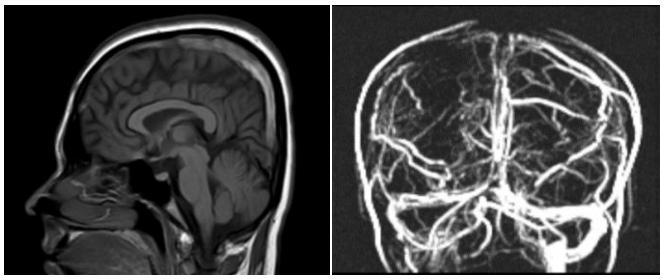


Figure 3: Sagittal T1 and coronal MIP image shows superior sagittal sinus thrombosis

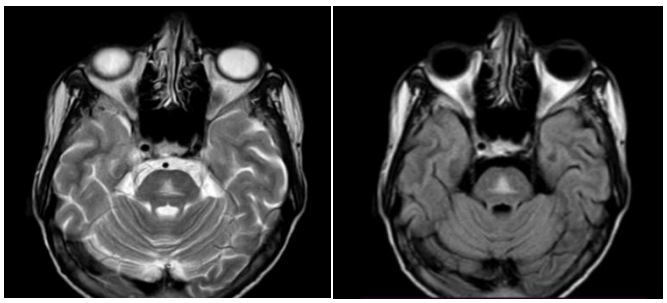


Figure 4: Axial T2/FLAIR images show classical trident shaped high signal intensity in bilateral median hemi pons, seen in Osmotic demyelination syndrome

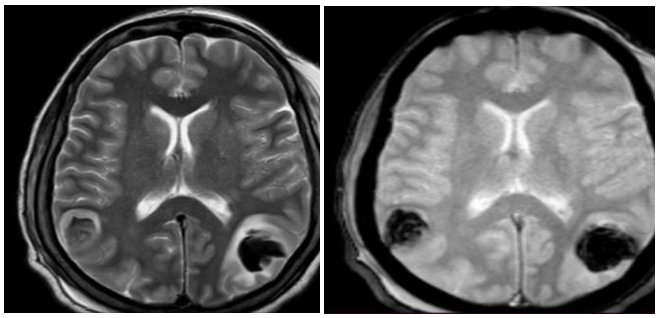


Figure 5: Axial T2 and GRE sequences show two hemorrhagic venous infarcts in bilateral posterior parietal region.

Discussion

The period following childbirth, referred to as the postnatal phase or puerperium, commences promptly after the birth of the infant and placenta, extending for 6-8 weeks thereafter. Postpartum issues, both obstetric and non-obstetric, pose significant health risks for women of childbearing age, underscoring the vital contribution of radiologists in evaluating these conditions, often necessitating a comprehensive imaging approach involving multiple modalities[4].

Our study focuses mainly on the neurological disorders developed during the puerperal period and excludes pre-existing neurological and psychiatric illnesses. And as such 35 puerperal patients were included in this study who presented with neurological impairment.

Incidence: Incidence rate of neurological disorder was 625/100000 deliveries. Among which the incidence rate of PRES and CVT was 285/100000 deliveries and 214/100000 deliveries respectively.

Age of presentation: The most common occurrence of neurological disorder in this study falls in the age group of 21-30 years accounting for 74% of cases.

Neurological symptoms: As per previous studies acute onset headache is the most common symptom noted in the postpartum period accounting for approximately 39-80% of neurological symptoms in that period. The same result was reflected in our study with 49% of patients presenting with acute headache.

The spectrum of neurological cases: The commonest puerperal-related neurological disorder to occur in our study was PRES(45%) followed by CVT (34%). Most of these disorders occurred during the early postpartum period (< 48 hours) making it the most crucial period for the vigilant care of puerperal patients.

Duraipandi M et Al, in their study, found the most common cause of peripartum encephalopathy as PRES accounting for 32%[5]. Our study reflected the same with 16(45%) out of 35 cases presenting with PRES. Among the 16 cases presenting with PRES 15 cases were typical PRES involving the posterior parieto-occipital cortical and subcortical cerebral regions and 1 case was atypical PRES as it involved brain stem and cerebellar hemisphere without cerebral involvement.

Second most common disorder was CVT with 8 cases involving the superficial cerebral venous sinus and 4 cases involving superficial cortical veins. In our study we did not encounter any case of deep cerebral venous thrombosis. All cases were easily identified in T1 and T2/FLAIR sequences with MR venography confirming the findings.

Due to electrolyte imbalance particularly hyponatremia and its rapid correction, non-inflammatory demyelination of central pons, basal ganglia, thalami, and hippocampioccurs. This abnormality is called osmotic demyelination syndrome[6]. We had one case of ODS which presented with quadriparesis and pseudobulbar palsy secondary to involvement of corticospinal and corticobulbar tracts. The patient had a protracted clinical course and ultimately succumbed to death due to rapid deterioration of the condition.

In western countries arterial infarcts are common than venous infarcts in puerperal patients, however in India the reversal is true. Similarly in our study all infarcts were due to venous occlusion and no arterial infarcts were noted. It was also noted that CVT with hemorrhagic venous infarct had poor prognosis than CVT alone.

Mortality of postpartum patients due to neurological disorders is rare, in our study, 3 patients died during the postpartum period. One case each of atypical PRES involving the brainstem, hemorrhagic transformation of large venous infarcts, and severe anoxic brain injury were responsible for deaths in the postpartum period.

Conclusion

Radiologists and obstetricians should always be vigilant in recognizing the postpartum signs and symptoms of neurological disorder and should appropriately advise imaging tests as early as possible. MRI plays a crucial role in early and accurate diagnosis of neurological abnormalities. Hence will aid in proper management of puerperal patients and help reduce maternal morbidity and mortality.

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