

Study of the imaging features of various neurological pathologies in post-partum period using MRI

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Abstract


Introduction: Any neurological disorder during post-partum period could have serious consequences for mother and also for child as many of them are related with pregnancy. Neurological disorders contribute to approximately 20% of maternal deaths¹. Symptoms and signs are nonspecific, and it can be difficult to differentiate between these conditions on clinical grounds alone. **Aims and Objectives:** To Study the imaging features of various neurological pathologies in post-partum period using MRI. **Methodology:** It was a cross sectional study of 40 patients done in tertiary care hospital. 1st November 2013 to 1st November 2015. The study was carried out on GE SIGNA HDxT 1.5 Tesla MRI machine. The studies were performed on GE SIGNA HDxT 1.5 Tesla MRI machine using HD8ch HiRes head coil. **Result:** Out of 24 patients of PRES, 4 patients were found to have PRES with infarct and 1 patient was found to have SAH. Total number of patients having cerebral venous sinus thrombosis was 10, out of which only 1 (10%) patients was without any neuro-parenchymal change however rest of the 9 (90%) patients were having neuro-parenchymal changes. Out of 10 patients of CVT, 9 patients were found multiple locations of thrombosis. Superior sagittal sinus (70%) was found the commonest sinus to be thrombosed followed by transverse sinus (60%). Blooming present in 25% and absent in 75% in Gradient/SWI Diffusion weighted imaging showed Presence of Restriction in 32.5% patients and absent in 67.5%. **Conclusion:** MRI is a key imaging modality in the evaluation of various pathologies of brain in post-partum patients with neurological complications owing to its superior contrast resolution, lack of ionizing radiation and in better characterization of lesions from imaging it is clear that not all post-partum neurological complications are not related to eclampsia and imaging plays an inevitable role for the diagnosis of array of various pathologies
Keywords: PRES (Posterior reversible encephalopathy syndrome) SAH (Sub Arachnoid Haemorrhage), CVT (Cerebral Venous Thrombosis), Gradient/SWI Diffusion.

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INTRODUCTION

Any neurological disorder during post-partum period could have serious consequences for mother and also for child as many of them are related with pregnancy. Neurological disorders contribute to approximately 20%

of maternal deaths.¹ Symptoms and signs are nonspecific, and it can be difficult to differentiate between these conditions on clinical grounds alone. The importance of early and accurate diagnostic imaging is underscored by the fact that most patients are otherwise young and healthy and prompt institution of appropriate therapy can result in complete recovery. So it is important that radiologists be familiar with these entities so that these patients can be diagnosed and therefore treated rapidly and efficiently. Acute neurological symptoms within 6 weeks after an uncomplicated pregnancy and delivery are unexpected and alarming. Although acute neurological diseases requiring hospitalization are rare in young women, several are unique to pregnancy and the postpartum period. Though the average age of pregnancy has increased from 24.6 to 27.2 in the past 30 year

globally², In India the average age of 1st pregnancy is 19.9 years, with increasing pregnancy associated complications such as eclampsia, gestational diabetes, and hypertension². Many of the neurological diseases can lead to devastating complications if not recognized early. Some, like preeclampsia, are easily recognized by obstetricians and are managed without significant neurological input unless seizures develop. The incidence of eclampsia in India has been quoted as 1.56%³. Eclampsia continues to be an important cause of maternal and perinatal morbidity and mortality⁴. Some diseases such as cerebral venous thrombosis (CVT) initially present with nonspecific symptoms such as headache. However, headache is a common complaint in pregnant women and distinguishing the benign headache from one that is a sign of serious disease is often not considered until serious neurological complications develop. Neurological disorders during pregnancy and puerperium can be classified into three subgroups⁵. Diseases which existed already before pregnancy or appear just by chance (e.g.: Migraine). Diseases that can display a higher incidence in pregnancy (e.g.: Cerebrovascular disease). Diseases with neurological symptoms which occur only with pregnancy. (e.g.: Pre eclampsia/Eclampsia). Eclampsia is one of the most common acute neurological events occurring during pregnancy. However, there are many other conditions e.g.: arterial ischemia and infarction, intracranial hemorrhage, veno-occlusive disease, vasculitis that can present during pregnancy that may either mimic eclampsia or produce other neurological manifestations. Hypertensive disorders remain among the significantly most unsolved problems in obstetrics. Pre-eclampsia a complex disorder characterized by pregnancy induced hypertension, proteinuria and edema occurring after twenty weeks of pregnancy. Eclampsia is a poorly understood multisystem complication of pregnancy that substantially contributes to maternal morbidity and mortality. The typical clinical picture is of generalised tonic clonic seizures during the third trimester, labor, or early puerperium in women who already have hypertension, proteinuria, and oedema. The previously controversial existence of a delayed postpartum variant of eclampsia is now acknowledged by most experts⁶. Convulsions with initial presentation more than 48 hours post partum but less than six weeks after delivery are commonly referred to as late postpartum. Most antenatal and intrapartum cases of eclampsia present to obstetricians, but late postpartum cases are more likely to be encountered by non-obstetricians. Late onset postpartum eclampsia can occur in normotensive women with uncomplicated pregnancies, not just in women with pre-eclampsia. Postpartum eclampsia can present with a variety of clinical and neurological

symptoms and signs, severe and persistent headache, visual symptoms, epigastric or right upper quadrant pain, and hypertension can present as prodromal symptoms before the onset of eclampsia⁶. Eclampsia should be considered in any postpartum woman who develops any of these prodromal symptoms. Further indicators include convulsions up to six weeks after delivery, hypertension, or proteinuria. This is important as eclampsia is amenable to treatment with magnesium sulphate. Late onset postpartum eclampsia can occur in normotensive uncomplicated postpartum women as well as in women with pre-eclampsia. The presence of prodromal symptoms should be thoroughly investigated, even in the absence of antecedent pre-eclampsia. Diverse pathologic conditions affect the central nervous system (CNS) during pregnancy and the puerperium. Some are specific to the physiologic process of reproduction (e.g., eclampsia, postpartum cerebral angiopathy). Others are nonspecific but occur more often in pregnant women (e.g., cerebral infarction, dural venous thrombosis). Recognition of the characteristic imaging findings in eclampsia, for example, may allow exclusion of other disorders. Even when imaging changes are nonspecific, knowledge of those entities associated with pregnancy and awareness of the increased likelihood of certain diseases in pregnancy will allow a more informed differential diagnosis. Differentiation of primary nonaneurysmal subarachnoid hemorrhage (SAH) from aneurysmal SAH is an example. Moreover, earlier use of imaging will result in fewer delayed diagnoses. For example, magnetic resonance venography allows early diagnosis of cerebral venous thrombosis. Even when the imaging changes are less specific, knowledge of likely possibilities will lead to more appropriate earlier use of imaging. The early use of CNS imaging to avoid the consequences of a delayed diagnosis.

MATERIAL AND METHODS

It was across sectional study of 40 patients was done in tertiary care hospital. Institutional ethics committee clearance and approval of MUHS were obtained prior to study. Written informed consent was obtained from subjects for inclusion of their images in the study, with standard disclosures. We studied 40 patients from 1st November 2013 to 1st November 2015. The cases were included in a cross sectional observational study conducted over this period. The study was carried out on GE SIGNA HDxT 1.5 Tesla MRI machine. Patients referred by obstetrics and gynaecology department All post-partum patients including patients up to six weeks of termination of pregnancy presenting with the clinical history of acute neurological illness such as seizures, alteration of sensorium, severe headache, focal

neurological deficit and visual loss in varying combinations. Refractory atypical eclampsia –those patient who do not respond to in Mg SO₄ and anti-hypertensive after 24 hrs initiation of the treatment and develop repeated episodes of convulsions included into study while Patients with known neurologic disease such as epilepsy, a history of previous stroke and known central nervous system malformation. Contraindications for MRI: Patients having, Ferromagnetic Ocular foreign body, Brain Aneurysm Clip, Implanted neural stimulator, Implanted cardiac pacemaker or defibrillator Cochlear implant, other implanted medical devices: (e.g. Swan Ganz catheter), Insulin pump, Metal shrapnel or bullet Patients with surgery of uncertain type where the presence of metal clips or wires cannot be excluded were excluded from the study. The studies were performed on GE SIGNA HDxT 1.5 Tesla MRI machine using HD8ch HiRes head coil. Written informed consent for participation in the study was taken prior to the scan. Sedation was given by anesthetists to patients included whenever required. The study included –Survey or localizer sequence for planning.DWI, FLAIR axial images. Sagittal T2 weighted images. Axial T1W and T2W images. Susceptibility weighted imaging /gradient imaging. MR venography sos if required.MR 3D TOF angiography sos if required. Due to possibility of excretion of contrast in breast milk with potential hazard to feeding baby gadolinium based contrast media are given very selectively in lactating female hence it was not given in our patients.⁸

RESULT

Table 1: PRES with other imaging manifestations

Sr. No	PRES with other imaging manifestations	No of patients
1	PRES with infarct	4(16.6%)
2	PRES with SAH	1(4.16%)
3	PRES without infarct/hemorrhage	19(79.16%)
	Total	24 (100%)

Out of 24 patients of PRES, 4 patients were found to have PRES with infarct and 1 patient was found to have SAH.

Table 2: Cerebral venous thrombosis with other imaging manifestations

Sr No	CVT with other imaging manifestations	No. of patients
1	CVT with venous infarct without hemorrhage	3(30%)
2	CVT with venous infarct with hemorrhage	6(60%)
3	CVT without any neuro-parenchymal changes	1(10%)
	Total	10(100%)

Total number of patients having cerebral venous sinus thrombosis were 10, out of which only 1 (10%) patient was without any neuro-parenchymal change however rest of the 9 (90%) patients were having neuro-parenchymal changes.

Table 3: Distribution of thrombosed cerebral venous structures

Sr no	Thrombosed venous structure	No of patients
1	Superior sagittal sinus	7(70%)
2	Transverse sinus	6(60%)
3	Sigmoid sinus	4(40%)
4	Straight sinus	1(10%)
5	Jugular bulb	3(30%)
6	Cortical vein	3(30%)

Out of 10 patients of CVT, 9 patients were found multiple locations of thrombosis. Superior sagittal sinus (70%) was found the commonest sinus to be thrombosed followed by transverse sinus (60%).

Table 4: Distribution of lesions presenting with and without blooming

Sequence	Blooming present	Blooming absent	Total
Gradient/SWI	10(25%)	30(75%)	40(100%)
Blooming present in 25% and absent in 75% in Gradient/SWI			

Table 5: Distribution of lesions presenting with and without diffusion restriction on diffusion weighted imaging:

Sequence	Restriction present	Restriction absent	Total
Diffusion weighted imaging	13(32.5%)	27(67.5%)	40(100%)

Diffusion weighted imaging showed Presence of Restriction in 32.5% patients and absent in 67.5%.

DISCUSSION

Neurological effects of pre-eclampsia/eclampsia can be antepartum or post-partum, the latter being more common⁷. These are due to irregularities in the autoregulation of cerebral circulation⁸. Disruption of the blood-brain barrier occurs due to both the hypertension-induced capillary damage and the immune-mediated endothelial dysfunction. This leads to extravasation of red cells and plasma proteins into perivascular space causing cerebral edema⁹. Cerebral vasospasm, produced by a combination of reaction to hypertension, prostaglandin deficiency, defects in the e-NOS gene (coding for nitric oxide synthase) and endothelial damage, play an important role, producing ischemia and infarction in the brain tissue^{10,11}. The impaired blood coagulation system and the abnormalities and deficiency of platelets predispose to intra-cranial bleeds¹². The total number of

patients included in our “Study of role of magnetic resonance imaging of brain in evaluation of post-partum neurological complications.” were 40. In our study 10(25%) patient were found to have cerebral venous sinus thrombosis similar trend was found by *Al-Hayali RM et al* in 2008 published in article “Peripartum neurological emergencies in a Critical Care Unit.” in that study 30 patients were studied amongst which only 7 patients were found to have CVT¹⁴. *Gregory Piazza et al* published in 2012 in the article ‘Cerebral Venous Thrombosis’ that Magnetic resonance imaging of the head combined with MR venography is the most sensitive study for detection of cerebral venous thrombosis in the acute, subacute, and chronic phases. Acutely, cerebral venous thrombosis appears isointense to brain tissue on T1-weighted images and hypointense on T2-weighted images. In the subacute phase, thrombus appears hyperintense in both T1- and T2-weight images. On MR imaging the lesions were found heterogeneously hyperintense on T2 and FLAIR sequences and showed discrete, confluent areas and restricted diffusion on DWI. On gradient sequences depending on hemorrhage blooming was noted. The affected venous sinuses showed absent flow void on T2 weighted images with blooming on gradient sequences. Almost all the cases presented were in subacute phase of thrombus development where the signal is predominantly hyperintense on both T1-weighted images and T2-weighted images with loss of flow void in respective venous sinus. On 3 dimensional time of flight MR venography the involved venous sinus was not visualized s/o thrombosis. Out of 10 patients of CVT, 9 patients were found multiple locations of thrombosis. Superior sagittal sinus (70%) was found the commonest sinus to thrombosed followed by transverse sinus (60%). similar findings were seen by *Thota Naveen, G. Rama Krishna, BhumaVengamma, D. Dayakar, J. Dushyanth* in 2015¹³. Hemorrhages :*Hefzy et al*¹⁵ found hemorrhages in PRES may be seen in as many as 15% of cases, 3 types of hemorrhages, namely, microhemorrhages, intraparenchymal hemorrhages, and subarachnoid hemorrhages, with equal frequency. Susceptibility-weighted imaging has increased the ability to detect hemorrhage and show corresponding area of blooming. *Sue Yin Lim; Nikos Evangelou; SibylleJürgens et al* published in 2014 “In contrast to non-obstetric subarachnoid haemorrhage, those occurring in the peripartum period are more often non-aneurysmal. Radiological signs suggesting a non-aneurysmal cause include a perimesencephalic pattern of bleeding or cortical subarachnoid blood (affecting the sulci of cerebral convexity and sparing the basal cisterns). Of note, cortical subarachnoid haemorrhage can also complicate reversible cerebral vasoconstriction syndrome

and cerebral venous sinus thrombosis. Other non-aneurysmal causes of subarachnoid haemorrhage relevant to the postpartum period include intracranial cervicocephalic artery dissection and acute hypertensive crisis, with or without pre-eclampsia. All these can also present as a severe explosive-onset headache, even without haemorrhage¹⁶. In our study total 10(25%) patients show blooming on gradient imaging out of which 2(5%) patients were found to have SAH, 2(5%) patients had SDH, and 6(15%) patients had intra parenchymal hemorrhage.

CONCLUSION

MRI is a key imaging modality in the evaluation of various pathologies of brain in post-partum patients with neurological complications owing to its superior contrast resolution, lack of ionizing radiation and in better characterization of lesions from imaging it is clear that not all post-partum neurological complications are not related to eclampsia and imaging plays an inevitable role for the diagnosis of array of various pathologies.

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