

Correlation between Neuroimaging and Clinical Presentation in Eclampsia

Krishna Dahiya, Mahesh Rathod, Seema Rohilla, Pushpa Dahiya
Department of Obstetrics and Gynecology, Pt.BDS, PGIMS, Rohtak

Email: krishnadahiya@rediffmail.com, drkrishnadahiya@gmail.com

Abstract

Eclampsia, the dramatic and life-threatening complication of preeclampsia, is characterized by convulsion or coma not attributable to any organic neurological disease. This study was aimed to assess the utility of MRI by correlation of clinical presentation and neuroimaging findings in patients with antepartum and post-partum eclampsia so as to initiate the proper management. The objectives of the present study were to correlate the neuroimaging (Magnetic Resonance Imaging) findings and clinical presentation in patients with eclampsia. This one year prospective study was conducted in the Department of Obstetrics and Gynecology, PT.B.D.Sharma, PGIMS, Rohtak. A total of 50 women with a diagnosis of eclampsia (both antepartum and postpartum) were included in the study. MR Imaging was done in all cases. Twelve (24%) patients had findings on MRI and no abnormality detected in 38 (76%) patients. Accordingly, the study was divided into two groups, study group in which patients had findings on MRI and compared with control group in which patients had no findings on MRI. In this study MRI revealed normal findings in 76% of the women. In those with abnormal MRI findings the commonest diagnosis was cerebral venous thrombosis with infarct (10%) followed by infarct (8%), Posterior reversible encephalopathy syndrome (4%), hypertensive leucoencephalopathy (2%). The commonest neurological presentation in patients with CVT with infarct was headache (65.22%), followed by unconsciousness (47.83%).

Keywords

Neuroimaging, Eclampsia, hypertensive leucoencephalopathy, MRI, post-partum, Fundoscop

I. Introduction

Pre-eclampsia and eclampsia are two clinical situations that are exclusively associated with pregnancy [1]. The incidence of eclampsia is around 1 in 2000 deliveries in developed countries and as high as around 1 in 100 to 1 in 1700 in developing countries [2]. It causes 14% still births and 6% of neonatal deaths [3]. Eclampsia occurs in antepartum period in 35-45%, intrapartum in 15-20% and in postpartum period in 30-45%. Unfortunately there is very little change in the incidence of eclampsia in the last half century. Effective strategy for both prevention and management can improve the pregnancy outcome [4]. Eclampsia, the dramatic and life-threatening complication of preeclampsia, is characterized by convulsion or coma not attributable to any organic neurological disease. Eclampsia and other neurologic manifestations, like headache, hyper-reflexia, visual symptoms, somnolence are due to cerebral circulatory dysregulation [5].

Eclampsia contributes to one-third maternal mortality in developing countries where resources for patient investigation and management are limited. It is a major obstetric emergency that requires mobilization of efforts and adequate management to avoid catastrophic events. The appearance and recognition of premonitory symptoms lowers the maternal morbidity and mortality by early detection. The delayed onset and atypical presentation lead to misdiagnosis [6].

Computed tomography (CT) and MRI of brain have revolutionized visualization of lesions in

eclampsia and other organic conditions. CT is a rapid initial imaging tool preferred to MRI in some conditions, like hemorrhage and space occupying lesions and complementary to MRI in others [7].

Though it is a multi-system complex hypertensive disorder, central nervous system involvement is common in these women and is frequently evident when specifically evaluated. The most common neuropathologic change seen is multi focal petechial hemorrhage at the grey-white matter junction. Abnormal findings on neuroimaging have been noted in as many as 90% of women with eclampsia. Most common lesions are seen in the parieto-occipital lobes in the distribution of posterior cerebral arteries. MRI studies of eclampsia describe these as a result of vasogenic edema induced by vasospasm and other changes contributing to pathophysiology of eclampsia. The objectives of the present study were to correlate the neuroimaging (Magnetic Resonance Imaging) findings and clinical presentation in patients with eclampsia.

II. Patients and Methods

This one year prospective study was conducted in the Department of Obstetrics and Gynecology, PT.B.D.Sharma, PGIMS, Rohtak over a period of 1 year. A total of 50 women with eclampsia (both antepartum and postpartum) were studied. Women who were known case of hypertension, epilepsy. Seizures due to metabolic disturbances, space occupying lesions or intracerebral infections

were excluded from study. Eclamptic women were first stabilized with magnesium sulfate as anticonvulsant and antihypertensive. Detailed history was elicited. Patients were subjected to investigations such as hemoglobin, 24 hour urine protein, renal function tests, liver function tests, absolute platelet count and fundoscopy. Further, these women were subjected to magnetic resonance imaging with Philipp Intra Nova gradient 1.5T and magnetic resonance venography wherever necessary. Maternal demographic, clinical, laboratory and neuroimaging data, fetomaternal outcome and associated morbidities were collected and analyzed. The categorical data was expressed as rates, ratios and proportions and continuous data was expressed as mean \pm standard deviation (SD). The comparison was done using chi-square test and unpaired student 't' test. Sensitivity, specificity, positive predictive value and negative predictive value were calculated to find the accuracy of neurological presentation in determining the diagnosis. A probability value (p value) of less than 0.050 was considered as statistically significant.

III. Results

During the study period 50 eclamptic women among 11644 deliveries underwent MR Imaging. Twelve (24%) patients had findings on MRI and no abnormality detected in 38 (76%) patients. Accordingly, the study was divided into two groups, study group in which patients had findings on MRI and compared

with control group in which patients had no findings on MRI.

The mean age of the study group was 22.61 ± 2.72 years and in control group 23.28 ± 2.81 years (p value-0.136). Forty-three women (86%) were belonging to rural area and 7(14%) patients belonged to urban area (0.027). Thirty-three (66%) of the women presented with post-partum eclampsia while 17 (34%) had antepartum eclampsia. 48 women (96%) were unbooked cases and only 2 (4%) cases were booked. 6 (12%) patients were of lower middle class, 12 (24%) patients were of upper lower class and 32 (64%) patients were belonging to lower class Out of 12 patients in study group who showed positive MRI findings , 6 patients were primiparous, 3 were para two, 2 were para three and one belonged to para four. The mean gestational age in women with antepartum eclampsia was 35.56 ± 3.17 weeks and in those with post-partum eclampsia the mean day of presentation was found to be 3.82 ± 1.93 days. Fourtytwo (84%) of the women had ≤ 3 episodes of seizures while 8 (16%) of the women had 4 or more episodes of fits. Out of 12 patients in study group 7 patients with less than 3 episodes of fits and 5 patients who had more than 4 episodes of seizures showed findings on MRI (p value 0.005). Four patients had recurrent fits, of which 3 showed findings on MRI and in one patient MRI was normal.

The commonest clinical presentation was unconsciousness 17(34%). The other presentations included altered sensorium 7 (14%), frothing 6 (12%) and incontinence 3 (6%). 11 out of 12 patients of study group who were unconscious, showed findings on MRI (p value 0.000). 4 out of 12 patients of study group with altered sensorium showed findings on MRI (0.027). One patient had frothing (p value 0.654) and one patient with incontinence (p value 0.696) out of 12 in study group showed findings on MRI. The mean systolic blood pressure in study group was found to be 156.46 ± 13.03 mm of hg, diastolic was 101.62 ± 6.94 mm of Hg. In control group mean SBP was found to be 148.28 ± 13.56 and diastolic blood pressure was 96.42 ± 7.12 mm of Hg (p value- 0.404). Headache was the commonest symptom reported by 21 women (42%) followed by blurring of vision 11 (22%) and vomiting 10 (20%). More than one premonitory symptom was present in 11(22%). 11 patients out of 12 patients in study group, who had complained of headache showed MRI findings (p value 0.001) and 6/12 patients having blurring of vision showed MRI findings (p value 0.007). 2 patients out of 3 having hemiplegia / hemiparesis showed findings on MRI (p value 0.074) and 2 patients had facial deviation out of which one showed findings on MRI (p value 0.380) as mentioned in table (2).

Out of 6 patients with GCS 3, 5 patients showed MRI findings (p value 0.000), 5 patients with GCS 4-10 showed MRI findings (p value 0.064) and 2 patients with GCS 11-15 showed findings on MRI (p value 0.495). Fundoscopy was normal in normal in 44 patients. Out of 12 patients in study group six patients with normal fundoscopy showed positive MRI findings. One with Grade 2 changes, two with Grade 3 changes and one with grade 4 change showed positive MRI findings (p value- 0.520). In study group two patients had decreased upper and lower limb tone, three patients had decreased power, four patients had decreased reflexes and two patients had decreased sensory reflexes which showed findings on MRI. The mean uric acid levels among study group was 0.41 ± 0.11 mmol/ L and in control group it was 0.26 ± 0.10 mmol/ L (p value- 0.003). Mean serum creatinine levels in study group was found to be 80 ± 18 μ mol/ L, 71 ± 9 μ mol/ L (p value- 0.04). In present study 17 patients delivered inside our hospital out of which 14 (28%) cases were live births and 3 (6%) cases were IUDs. 3 (6%) cases were IUGR babies.

MRI typically demonstrated bilateral hyper intense lesions on T2-weighted images and hypo intense lesions on T1-weighted images without diffusion restriction with diagnosis of cerebral venous thrombosis without infarct 5 (10%), CVT with infarct 4 (8%) Posterior reversible encephalopathy syndrome 2 (4%),

hypertensive leucoencephalopathy 1 (2%).(91.7%, 73.7%, 52.4%, 96.6% as mentioned in Table1) In our study out of 50 patients, 21 patients had neurological signs and symptoms out of which 11 patients showed positive MRI findings. On correlating clinical presentation with MRI findings the sensitivity, specificity, positive predictive value and negative predictive value of the MRI were found to be table (3).

Table (1): Magnetic resonance imaging findings

Findings		
	No.	%
CVT without infarct	5	10.00
Infarct	4	8.00
Posterior reversible encephalopathy syndrome	2	4.00
Hypertensive leucoencephalopathy	1	2.00
No abnormality detected	38	76.00
Total	50	100.00

Table (2): Location of lesions at MRI

Neurologic symptoms	Location of lesions at MRI	Residual neurologic deficits
Headache	Occipital	No
Fits	Parietal	No
Disorientation	Parietal	Ataxia
Vertigo	Parietal	No
Absent vision	Occipital	Blurring of vision
Dizziness	Parietal	No

Table (3): Accuracy of neurological signs and symptoms in determining the MRI diagnosis

Neurological signs and symptoms	MRI findings		Total
	Positive	Negative	
Present	11	10	21
Absent	1	28	29
Total	12	38	50

Sensitivity	Specificity	PPV	NPV
91.7%	73.7%	52.4%	96.6%

IV. Discussion

Eclampsia represents advanced stages of pregnancy induced hypertension and is associated with considerable morbidity and mortality of pregnant women. Neurologic manifestations of pre-eclampsia include headache, confusion, hyperreflexia, visual hallucinations and blindness.

Despite the availability of intensive care units and advanced technology, some women still die from eclampsia. A common cause of death in eclampsia is central nervous system pathology such as intracerebral hemorrhage or massive cerebral edema. It is obvious that improving our understanding of the neuropathophysiology of eclamptic seizures is imperative to appropriate management and reduction of morbidity and mortality [8]. Goal of cerebral imaging is to define abnormalities which may be treated to help decrease the morbidity and mortality associated with this condition and to define more clearly the characteristics of the disease to help prevent or decrease its occurrence in other women. The cause of eclampsia is unknown and there are many unanswered questions regarding the pathogenesis of its cerebral manifestations [9]. However, so far, few comprehensive study on the neurological and neuroradiological aspect of eclampsia has been published in the current neurologic literature in India.

Worldwide studies claim that postpartum eclampsia is more common nowadays [10]. 33 (66%) of the women presented with postpartum eclampsia while 17 (34%) had

anteartum eclampsia in present study. In our study, there was no statistically significant difference between blood pressure values, of cases with or without MR imaging evidence of brain lesions. But in cases of preeclampsia/eclampsia, brain lesions might occur although blood pressure values are normal but still higher than a patient's routine normal blood pressure. In the present study 42 (84%) of the women had ≤ 3 episodes of seizures while 8 (16%) of the women had 4 or more episodes of fits. Out of 8 patients 4 patients had recurrent fits, of which 3 showed findings on MRI and in one patient MRI was normal. As the number of episodes of seizures increased, the more positive MRI findings are found which is statistically significant (p value .005).

Clinical presentation like headache, vomiting, blurring of vision were seen in more patients of eclampsia in study group such as women who showed findings on MRI as compared to control group (p value 0.001). 11 patients out of 12 patients in study group, who had complained of headache showed MRI findings (p value 0.001) and in 10 patients MRI was normal.

In present study we categorized the patient on the basis of Glasgow coma scale. Out of 11 patients with GCS less than 10, ten patients showed CNS pathology on MRI and two patients with GCS 11-15 showed findings on MRI (p value 0.495). Complications like status epilepticus cases were 2 (4%), two cases each of pulmonary oedema and ARF, one case each of PPH, abruption, DIC, aspiration pneumonia were found. Three cases of each HELLP and neurologic deficit were found. Six (12%)

patients were shifted to ICU. There was no maternal mortality among 50 cases. MRI revealed normal findings in 76% of the women. In those with abnormal MRI findings the commonest diagnosis was CVT with infarct (10%) followed by infarct (8%), PRES (4%), HLE (2%). The commonest neurological presentation in patients with CVT with infarct was headache (65.22%), followed by unconsciousness (47.83%). If radiological and clinical findings occurring in PRES are easily recognized and treated immediately, they might be totally reversible. All the patients investigated in our study were discharged from the hospital without neurological deficit within 1-2 weeks. In most instances brain CT in eclamptics might be normal due to temporal relationship of scan to seizure, but this can be overcome with MRI. Neuroimaging within a short time after seizure in eclamptics may yield more abnormalities, presumably due to transient nature of lesions. Most common lesions detected on CT in eclampsia are focal areas of cerebral edema in subcortical white matter of parietal and occipital areas [6, 11]. A study [6], by Kokila MS reported 46.4% of women had other noneclamptic organic causes for postpartum seizures. 28.6% (8) of postpartum seizures were due to CVT. In this study, 21 patients had neurological signs and symptoms of eclampsia, out of which 11 patients showed CNS pathology on MRI and one showed negative MRI findings. 29 patients had no neurologic presentation, out of which one showed positive MRI findings and 28 showed negative MRI findings. The sensitivity, specificity, positive predictive value and negative predictive value were

found to be 91.7%, 73.7%, 52.4%, and 96.6% in present study.

These findings suggest that, the signs and symptoms at admission predict the neurological involvement and help to predict the likely diagnosis. The fair agreement and moderate sensitivity observed in this study could be explained by the fact that the patients with any one neurological sign and symptom was considered as having neurological diagnosis which yield in fair agreement as well as moderate sensitivity [12,13]. A prospective observational study¹⁰ was conducted by Jindal MA to compare CT and MRI findings of eclampsia patients with respect to neurological signs and symptoms reported that MRI was found to be co-relating more than CT with the neurological presentation and had 90% sensitivity and 100% specificity. Study concluded that, magnetic resonance imaging abnormalities in eclampsia correlate well with clinical findings as compared to CT and can be better imaging modality in eclampsia patients. In contrast, a study by Kokila MS et al [6], to correlate clinical and radiologic findings, to determine whether brain tomography affects management and routinely indicated in uncomplicated postpartum eclampsia and to differentiate it from other potentially treatable conditions concluded that, despite many abnormalities seen on imaging studies, some are incidental and transient, without chronic neurologic sequelae. Thus, expensive neuroimaging has limited role in uncomplicated cases with typical clinical course and prompt response to standard therapy. Thus, neuroimaging is indicated in atypical and fatal cases where specific therapy may be required.

MRI has an added advantage that it could be done on pregnant patients eliminating the radiation hazards pertinent to CT and had 90% sensitivity and 100% specificity as compared to CT; on the other hand CT failed to show some of the abnormalities that were picked up by MRI, hence it is a better option of imaging in an eclamptic patient. Overall, the present study showed the importance of neurological assessment in women with antepartum and post-partum eclampsia. Further studies with diagnosis specific neurological manifestations would emphasize the precise clinical presentations in women with eclampsia. MRI done in all cases were statistically non-significant but carries more importance when it is done in complicated cases (with abnormal neurological sign and symptoms, poor glassgow coma scale score, neurologic deficit ,etc.)

V. Conclusion

Some cases of eclampsia are without chronic neurologic sequelae and are transient. Thus the patients unresponsive to conventional treatment should be screened by MRI to exclude serious morbid CNS pathological conditions and MRI should be considered in all patients who are unconscious, with poor glassgow coma scale, focal neurologic deficit and abnormal laboratory findings.

VI. References

- [1]. Kuntz GA, Renato M, Rodrigues CA. Hellp syndrome, reversible posterior leukoencephalopathy syndrome and eclampsia. *Arq Neuro-Psiquiatr* 2009;67(4):1103-5.
- [2]. Mishra R. Ian Donald's practical obstetric problems. 6th ed., New Delhi; Advert Arnold B I Publication; 2007.
- [3]. Choudhary A. Eclampsia a hospital based retrospective study. *Kathmandu University Med J* 2003; 1(4): 237-41.
- [4]. Arias F, Duftary SN, Bihndi AG. Practical Guide to high risk pregnancy and delivery. 3rd ed., Noida; Elsevier; 2008
- [5]. Chakravarthy A, Chakravarthi SD. The neurology of eclampsia: Some observations. *Neurol India* 2002;50:128-35.
- [6]. Kokila MS, Dwivedi AD. Correlation of Clinical and Neuroimaging Findings affecting Management in Postpartum Eclampsia: A Prospective Study. *Journal of South Asian Federation of Obstetrics and Gynaecology* 2011;3(3):125-130.
- [7]. Lubarsky SL, Barton JR, Friedman SA, Nasreddine S, Ramadan MK, Sibai BM. Late postpartum eclampsia revisited. *Obstet Gynecol* 1994;83:502-05.
- [8]. Chakravarty A, Chakrabarti S D. The neurology of eclampsia : some observations. *Neurol India* 2002;50:128.
- [9]. Naidu K, Moodley J, Corr P, Hoffman M. Single photon emission and cerebral computerised tomographic scan and transcranial Doppler sonographic findings in eclampsia. *Br J Obstet Gynaecol.* 1997 Oct;104(10):1165-72.

- [10]. Jindal MA, Gaikwad HS, Hasija BD, Vani K. Comparison of neuroimaging by CT and MRI and correlation with neurological presentation in eclampsia. *Int J Reprod Contracept Obstet Gynecol.* 2013; 2(1): 83-87.
- [11]. Bannerjee S, Chakravarty A : Reversible brain lesions on MR imaging in a patient with eclampsia. *Journal of Association of Neuroscientists of Eastern India* 1997; 2 : 146-152.
- [12]. Cunningham FG, Twickler D. Cerebral edema complicating eclampsia. *Am J Obstet Gynecol* 2000;182:94-100.
- [13]. Felz Michael W, Barnes Daniel B, Figueroa Ramon E. Late postpartum eclampsia 16 days after delivery: Case report with clinical, radiologic and pathophysiologic correlations. *J Am Board Fam Pract* 2000;13(1):39-46.