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RESEARCH ARTICLE

Study of Neuroimaging in Patients with Refractory Eclampsia

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ABSTRACT

Need: Despite availability of intensive care units and improved antenatal care some women still die from eclampsia. Eclampsia is associated with increased risk of maternal death from 1.8% in developing countries to 14% in developing countries.Cerebral complications are the major cause of death in eclampsia patients. Eclampsia along with hypercoagulopathy of pregnancy is a high risk patient for development of cerebrovascular thrombosis/ischemic strokes. Eclampsia patients who are refractory to the routine treatment have been found to have various CNS pathological conditions amenable to the medical treatment.

Aim and objectives: To study the neurological changes in patients with eclampsia and to delineate the pathophysiology in patients with refractory eclampsia.

Materials and methods: Prospective study design where 30 patients were included in the study. All patients were admitted in the eclampsia room with h/o convulsions. All patients were put on $MgSO_4$ therapy and antihypertensives.The patients who are refractory to the treatment, such as having recurrent convulsions despite on $MgSO_4$ were selected for neuroimaging with CT scan. neuroimaging is done with Phillips Tomoscan CT scanner where slices of 10 mm thickness were taken through the entire brain in the transaxial plane. Abdomen shielding is done with lead shield to prevent radiation hazard.

Results:

Sr.	*Findings*	*Number of patients*	*Percentage*
1	Cerebral edema	20	
	• Mild to moderate	17	56
	• Severe	3	10
2	Hypertensive encephalopathy	5	16
3	Posterior reversible encephalopathy syndrome	11	36
4	Cerebral infarction	4	13
5	Cortical venous sinus thrombosis	2	16
6	Tuberculomas	2	6
7	Meningitis	1	3
8	Hydrocephalus	1	3
9	Normal	4	13

Conclusion: Eclampsia patients who were refactory to the treatment with $MgSO_4$ and antihypertensives have been found to have very significant and morbid CNS pathological conditions. Neuroimaging in this patients have done a pivotal role in identifying the abnormality and rectifying it with medical means which has surely improved patients condition and have reduced morbidity.

Keywords: Eclampsia, Refractory eclampsia, Neuroimaging in eclampsia.

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INTRODUCTION

Eclampsia is defined as occurence of one or more convulsions in pregnant woman with hypertension and proteinuria that can not be attributed to any other cause (Willams Obsterics).

The word eclampsia is derived from Greek word meaning flash of lightening. In developing countries like India, eclampsia complicates about 1 in 100 to 1 in 1700 deliveries. Despite availability of intensive care units and improved antenatal care, such as RCH, NRHM Programs some women still die from eclampsia.

Cerebral complications are the major cause of deaths in eclampsia patients but the neuropathophysiology of eclamptic seizure still remain undiscovered.[1] Eclampsia itself along with hypercoagulopathy of pregnancy is a high risk factor for development of CVTS and intracranial hemorrhage.[2-6] Although, eclampsia affects variety of organs, cerebrovascular involvment is the major cause of death in eclampsia patients.[4,6] There has been considerable debate as to whether the neurological symptoms of eclampsia arise from the overautoregulation that causes vasospasm and ischemia or from hyperperfusion that causes cerebral edema formation.[7]

To descibe neurological involvement in eclampsia two theories have been proposed.[6]

Theory of vasospasm: In severe hypertension as in eclampsia, cerebral autoregulation comes into play which causes cerebral vasoconstriction. This vasospasm is believed to cause local anoxic damage to endothelium of capillaries and disruption of blood brain barrier, which leads to cerebral edema.

Forced dilation theory: Sudden fluctuation in blood pressure exerts greater pressure on capillary walls and leads to extravasations of proteins and fluids: Pericapillary ring hemorrhages.

Most common finding on CT scan in eclampsia patient is generalized cerebral edema and features suggestive of hypertensive encephalopathy.[8] Neuroimaging can be very helpful in eclampsia patients who do not respond to conventional treatment with $MgSO_4$ and antihypertensives.[4] CT scan findings in eclampsia patient have found mainly transient cortical and subcortical white matter hypodensities which could be due to hypoxia or edema.[9]

These lesions corrospond to mainly watershed areas of circulation where anterior, middle and posterior cerebral arteries meet. It is in this area where earliest breakthrough in autoregulation occurs.[4,7,10]

AIM AND OBJECTIVES

To study the neurological changes in patients with eclampsia and to delineate pathophysiology in patients with refractory eclampsia.

MATERIALS AND METHODS

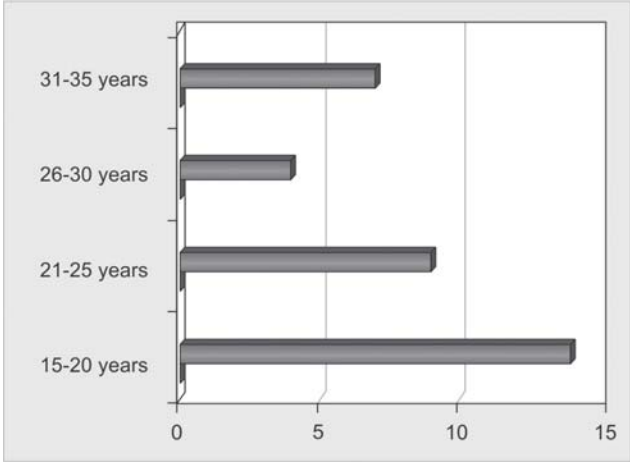
Prospective study was conducted at the Department of Obstetrics and Gynecology. Total 30 eclampsia patients were included in the study. Patients were selected by simple random sampling. On admission patients were first stabilized with antihypertensives and $MgSO_4$ therapy, detailed history was elicited.

Refractory/Atypical eclampsia: Those patients who do not respond to Inj $MgSO_4$ and antihypertensives after the 24 hours. initiation of the treatment and develop repeated episodes of convulsions still on $MgSO_4$ (blood level within therapeutic range 4-7 mEq/l) are labeled as refractory eclampsia.[4] In all patients neuroimaging was done with computed tomography.

OBSERVATIONS

Table 1: Distribution of age

Age of patient	*No. of patients*	*Percentage*
15-20 years	14	46
21-25 years	9	30
26-30 years	4	13
31-35 years	7	10

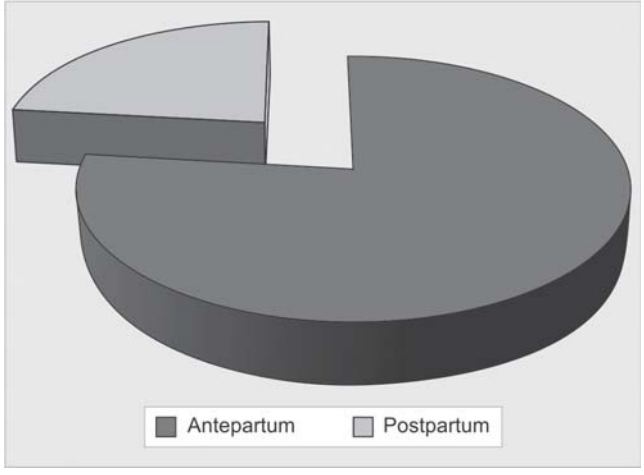


Graph 1: Distribution of age

In our study almost 46% eclampsia patients were primigravidae (Table 1). It supports the genetic theory of development of pre-eclampsia where alloimmunity between maternal and fetal tissues is the predisposing factor.[4] Most of the patients were aged less than 20 years while others between 21 and 25 years (Graph 1).

Table 2: Type of eclampsia

Type	*No. of patients*	*Percentage*
Antepartum	23	76
Postpartum	7	23
Intrapartum	—	—



Graph 2: Type of eclampsia

Though worldwide studies claim that postpartum eclampsia is more common nowdays,[2] our study came across more no. of (76%) antepartum eclampsia patients (Table 2 and Graph 2). Developing countries still are struggling with inadequate ANC Care and Hospital unsupervised deliveries.[11] In a recent survey still 50 to 60% deliveries occur at home conducted by untrained Dais (Table 3).

Table 3: Neurological signs

Symptoms	*No. of patients*	*Percentage*
Deep coma	3	30
Focal convulsions	1	10
Recurrent convulsions	18	60
Cortical blindness	2	06
Altered sensorium	6	20

Table 4: Type of $MgSO_4$ Regimen

Regimen	*No. of patients*	*Percentage*
Low dose	25	83
Pritchard	05	16

Low Dose regimen is devised by Dr Sardesai et al also called as Solapur regimen (Table 4). In this regimen initially 4 gm. IV Bolus injection. $MgSO_4$ is given dissolved in 20 cc of NS slowly over 20 minutes followed by 2 gm IM every 3 hourly in alternate buttocks. Principle behind giving 2 gm as a maintenance is that Indian women have less BMI as compared to Western counterpart so Pritchard Regimen is not suited to Indian women where overdose toxicity can happen.

Table 5: Glasgow Coma Scale on admission

Coma scale	*No. of patients*	*Percentage*
<10	3	10
10-12	7	23
13-14	20	65
>14	—	—

We have categorized the patients on the basis of Glagow Coma Scale (Table 5) where we found it extremely useful for individualization of the treatment. With the help of it we were

able to mark the recovery of patients also. There were three patients in our study in which the scale was less than 10, in all these patients we have found CNS pathology, such as severe cerebral edema, intracerebral hemorrhage.

Table 6: CT scan findings in eclampsia patients in our study

Sr.	Findings	No.of patients	Percentage
1.	Cerebral edema	20	—
	• Mild	17	56
	• Moderate	3	10
2.	Hypertensive encephalopathy	5	16
3.	Posterior reversible encephalopathy syndrome	11	36
4.	Intracerebral hemorrhage	2	6
5.	Cerebral infarction	1	3
6.	Cortical venous sinus thrombosis	1	3
7.	Tuberculomas	2	6
8.	Neurocysticercosis	1	3
9.	Hydrocephalus	1	3
10.	Normal finding	4	13

We have found neuroimaging pivotal in all eclampsia patients who were not responding to the conventional management with $MgSO_4$ and antihypepertensives. Mild cerebral edema was found in almost more than 50% patients and posterior reversible encephalopathy syndrome was important findings (Table 6). Tuberculomas were found in two patients on CT scan which responded to the antitubercular treatment along with mannitol. CVTS (cerebrovascular thrombosis) also found in few patients which prompted us to treat in the right direction. We have also found a very interesting case of neurocysticercosis which has duly responded to albendazole.

Maternal Outcome

All patients were recovered well after institution of appropriate treatment. However, few of the patients who were having cerebrovascular thrombosis had protracted recovery and recquired mechanical ventilation in the ICU.

Table 7: Fetal outcome

1.	Healthy neonates	16
2.	Preterm births	6
3.	Preterm required ventilatory support	3
4.	Preterm stillbirths	5

Induction of labor is done in all patients with eclampsia after initial stabilization with prostaglandins. Most of the neonates born were healthy but some of them recquired mechanical ventilation and NICU support (Table 7). Five were stillborn due to extreme prematurity and due to other complications, such as abruptio placenta.

CASE REPORTS

Case 1

Twenty six years primigravida with 32 weeks. Pregnancy came h/o 4 episodes of convulsions. On admission BP: 150/90 mm Hg.

Fig. 1: Multiple tuberculomas interspersed throughout the brain seen as white opacities

Proteinuria present. Started on injection $MgSO_4$ Pritchard regimen. Patient did not respond to $MgSO_4$ and thrown repeated episodes of convulsions. Patient taken for CT scan shown multiple calcified tuberculomas in entire brain (Fig. 1).

Case 2

Primigravida aged 22 years brought with h/o one convulsion at home. On admission her BP was 180/110 with 3+ proteinuria. Patient was put on $MgSO_4$ and antihypertensives. Induction done with PGE_2 Gel. After few hours patient suddenly become drowsy unresponsive to verbal commands. CT scan done and found to have large left occipital intracerebral Hemorrhage. Patient shifted to medical ICU and put on mannitol and mechanical ventilation (Fig. 2).

Case 3

Third gravida, full term referred from outside with h/o focal convulsions. On admissions BP: 140/100 with minimal proteinuria, patient conscious, well oriented. Patient thrown few episodes of convulsions though on $MgSO_4$, undergone CT scan and found to have neurocysticercosis cysts throughout brain (Fig. 3).

Case 4

Postpartum eclampsia patient delivered 2 days back was complaining of blindness and severe headache, blood pressure was 160/110 mm Hg on antihypertensives. We have done MRI and found to have PRES. Patient treated on mannitol and steroids, condition improved over 15 days (Figs 4A and B).

CONCLUSION

Eclampsia is a major cause of maternal mortality in India along with hemorrhage and infection. $MgSO_4$ treatment in eclampsia have shown to reduce morbidity and mortality in many patients and has been proved by many studies. In our study

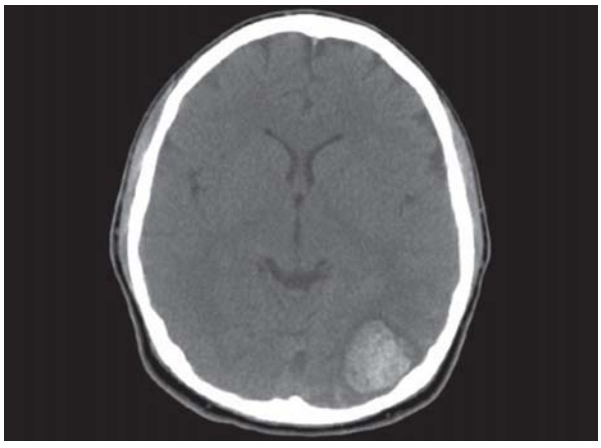


Fig. 2: Large occipital hemorrhagic infarct seen on left side

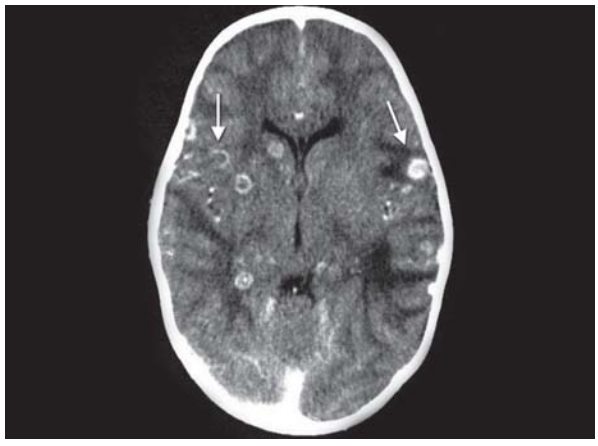
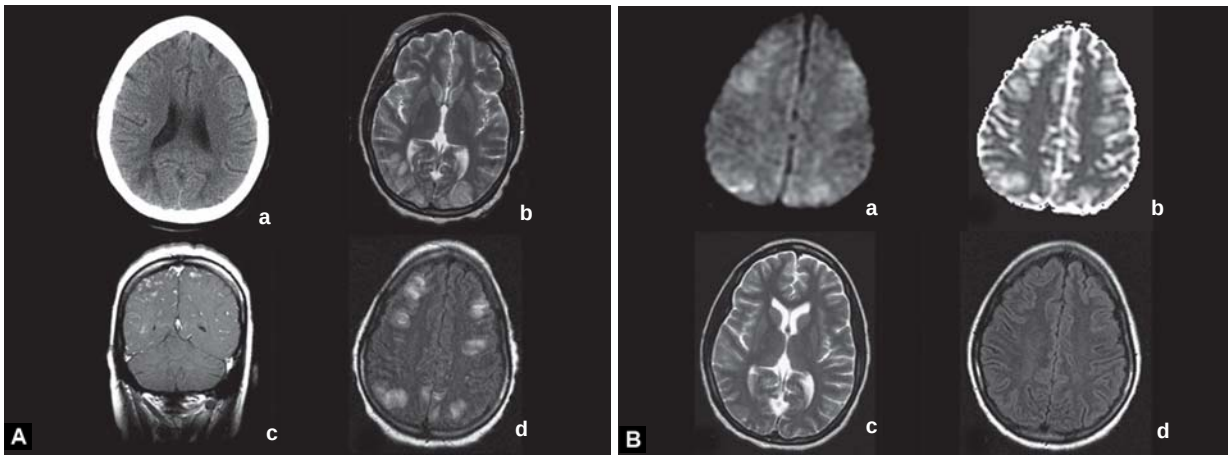


Fig. 3: Multiple cystic neurocysticercosis lesions seen in the brain



Figs 4A and B: (A) MRI image shows gyriform enhancement along with fluffy white opacities in the brain suggestive of cerebral edema, (B) resolution after 2 weeks as seen in the image with disappearance of opacities in the watershade areas along with normal looking gyrae

neuroimaging in eclampsia patients refractory to the conventional treatment have found various CNS abnormalities, such as venous infarct, cortical venous sinus thrombosis and infections, such as tuberculomas/neurocysticercosis.

Neuroimaging in these patients have done a pivotal role in identifying the abnormality and rectifying it with medical means which has surely improved patients condition and have reduced the maternal mortality.

So study concludes that eclampsia patients unresponsive to conventional treatment should be screened by neuroimaging (CT scan/MRI brain) to exclude serious morbid CNS pathological conditions.

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