

## Role of Neuroimaging in Patients with Atypical 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 varying from 1.8 % in developed 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 fact for patient in respect of 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.

**Aims and Objectives** (1) To study the neuropathophysiology behind an eclamptic seizure to reduce the morbidity associated with it. (2) To study the role of neuroimaging in patients with atypical eclampsia.

**Methodology** Prospective study design included 30 patients for the study. All patients were admitted in the

eclampsia room with h/o convulsions. All patients were put on MgSO<sub>4</sub> therapy and antihypertensives. The patients who are refractory to the treatment such as having recurrent convulsions despite therapy MgSO<sub>4</sub> were selected for neuroimaging with CT scan. Neuroimaging is done using Phillips Tomoscan CT scanner where slices of 10-mm thickness were taken through the entire brain in the trans-axial plane. Abdomen shielding is done with lead shield to prevent radiation hazard.

### Result

S. No.	Findings	Number of patients	Percentage
1	Cerebral oedema	20	
	Mild to moderate	17	56
	Severe	03	10
2	Hypertensive encephalopathy	05	16
3	Posterior reversible encephalopathy syndrome	11	36
4	Cerebral infarction	04	13
5	Cortical venous sinus thrombosis	02	16
6	Tuberculomas	02	06
7	Meningitis	01	03
8	Hydrocephalus	01	03
9	Normal	04	13

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**Conclusion** Eclampsia patients who were refractory to the treatment with MgSO<sub>4</sub> and antihypertensives have been found to have very significant and morbid CNS

pathological conditions. Neuroimaging in these patients have done a pivotal role in identifying the abnormality and rectifying it with medical means which had definitely improved patient's condition and have reduced morbidity.

## Introduction

Eclampsia is defined as occurrence of one or more convulsions in pregnant woman with hypertension and proteinuria that cannot be attributed to any other cause. The word eclampsia is derived from Greek word meaning flash of lightning. In developing countries like India, eclampsia leads to complications in about 1–100 out of 1700 deliveries. Despite availability of intensive care units and improved antenatal care such as RCH, NRHM programs, etc., 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 haemorrhage [2–6]. Although eclampsia affects variety of organs, cerebrovascular involvement 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 over autoregulation that causes vasospasm and ischaemia OR from hyperperfusion that causes cerebral oedema formation [7]. To describe 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 oedema.

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

Most common finding on CT scan in eclampsia patient is generalised cerebral oedema 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 oedema [9]. These lesions correspond to mainly watershed areas of circulation where anterior, middle and posterior cerebral arteries meet. It is in this area where the earliest breakthrough in autoregulation occurs [4, 7, 10].

## Aims and Objectives

To study the role of neuroimaging in Eclampsia patients who are refractory to conventional treatment.

To study the neuropathophysiology behind an eclamptic seizure.

To differentiate between eclamptic seizure and seizures due to any morbid CNS pathological conditions like CVTs, tumours, abscess or infectious pathology like tuberculomas.

## Material and Methods

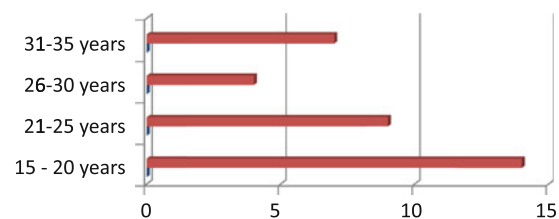
Prospective study was conducted at the department of obstetrics and gynaecology. A total of 30 eclampsia patients were included in the study. Patients were selected by simple random sampling. On admission, patients were first stabilised with antihypertensives and  $MgSO_4$  therapy, and detailed history was elicited.

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

## Observations

Distribution of age.

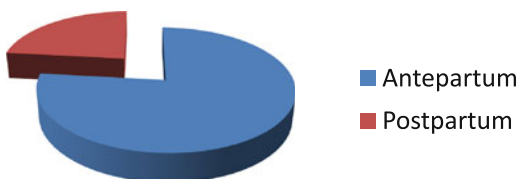
Age of patient (years)	No. of patients	Percent
15–20	14	46
21–25	09	30
26–30	04	13
31–35	07	10



In our study, almost 46 % eclampsia patients were primigravidae. It supports the genetic theory of development of pre-eclampsia where alloimmunity between maternal and fetal tissues is the predisposing factor [4].

## Type of Eclampsia

Type	No. of patients	Percent
Antepartum	23	76
Postpartum	07	23
Intrapartum	–	–



Although worldwide studies claim that postpartum eclampsia is more common nowadays [2], our study came across 76 % antepartum eclampsia patients. Developing countries still are struggling to cope with inadequate ANC care and hospital with unsupervised deliveries [11]. In a recent survey, almost 50–60 % deliveries still occur at *home* and are conducted by untrained dais.

## Neurological Signs

Symptoms	No. of patients	Percent
Deep coma	03	30
Focal convulsions	01	10
Recurrent convulsions	18	60
Cortical blindness	02	06
Altered sensorium	06	20

Type of MgSO<sub>4</sub> Regimen

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

Low dose regimen has been devised by Dr. Sardesai et al., also called as Solapur Regimen. In this regimen, initially 4 g. IV Bolus Inj. MgSO<sub>4</sub> dissolved in 20 cc of NS is given slowly for 20 min followed by 2 g IM every 3 h in alternate buttocks. Principle behind giving 2 g as a maintenance is that Indian women have less BMI as compared to her Western counterpart, and so Pritchard regimen is not suited to Indian women where overdose toxicity can happen.

## Glasgow Coma Scale on Admission

Coma scale	No. of patients	Percent
<10	03	10
10–12	07	23
13–14	20	65
>14	–	–

We have categorized the patients on the basis of Glasgow Coma Scale which we found as being extremely useful for individualization of the treatment. With the help of the same, we were able to register the recovery of patients also. There were three patients in our study in which the scale was <10; in all these patients, we have found CNS pathological conditions such as severe cerebral oedema, intracerebral haemorrhage, etc.

## CT Scan Findings in Eclampsia Patients

S. No.	Findings	No. of patients	Percent
1	Cerebral oedema	20	56
	Mild	17	10
	Moderate	03	
2	Hypertensive encephalopathy	05	16
3	Posterior reversible encephalopathy syndrome	11	36
4	Intracerebral haemorrhage	02	6
5	Cerebral infarction	01	3
6	Cortical venous sinus thrombosis	01	3
7	Tuberculomas	02	6
8	Neurocysticercosis	01	3
9	Hydrocephalus	01	3
10	Normal finding	04	13

We have found neuroimaging playing a pivotal role in all eclampsia patients who were not responding to the conventional management with MgSO<sub>4</sub> and antihypertensives. Mild cerebral oedema in almost more than 50 % patients and Posterior Reversible Encephalopathy Syndrome (PRES) were important findings. Tuberculomas was found in two patients on CT scan, who responded to the antitubercular treatment along with Mannitol. CVTS (cerebrovascular thrombosis) was also found in a few patients, which prompted us to proceed with the treatment in the right direction. We have also found a very interesting case of Neurocysticercosis which has duly responded to albendazole.

Maternal Outcome

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

Fetal Outcome

1	Healthy neonates	16
2	Preterm births	06
3	Preterm required Ventilatory support	03
4	Preterm stillbirths	05

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

Cases

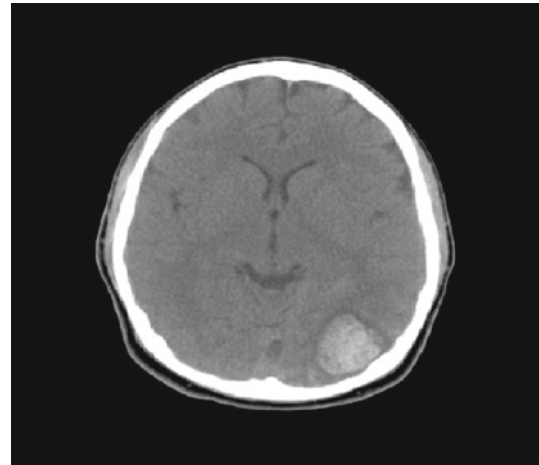
Case 01

26 years. Primigravida with 32 weeks. Pregnancy came h/o four episodes of convulsions. On admission BP: 150/90 mm Hg. Proteinuria present. Started on Inj.MgSO<sub>4</sub> Pritchard regimen. Patient did not respond to MgSO<sub>4</sub> and experienced repeated episodes of convulsions. CT scan taken on the patient showed multiple calcified tuberculomas in the entire brain.



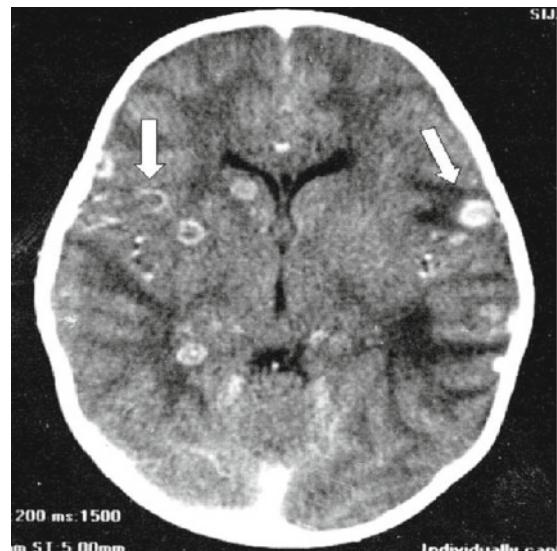
Case 02

Primigravida aged 22 years brought with h/o one convulsion at home. On admission, her BP was 180/110 mmHg with 3+ proteinuria. Patient was put on MgSO<sub>4</sub> and anti-hypertensives. Induction done with PGE2 Gel. After few hours, patient suddenly became drowsy unresponsive to verbal commands. CT scan was done and patient found to have large left occipital intracerebral haemorrhage. Patient shifted to medical ICU and put on mannitol and mechanical ventilation.



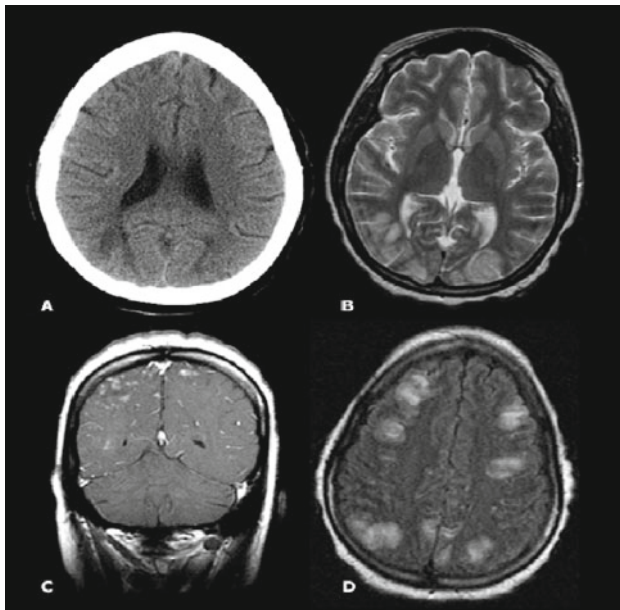
Case 03

III gravida, full term referred from outside with h/o focal convulsions. On admissions BP: 140/100 mmHg with minimal proteinuria, patient conscious, and well oriented. Patient experienced few episodes of convulsions despite being on MgSO<sub>4</sub>. Undergone CT scan and she was found to have neurocysticercosis cysts throughout brain.

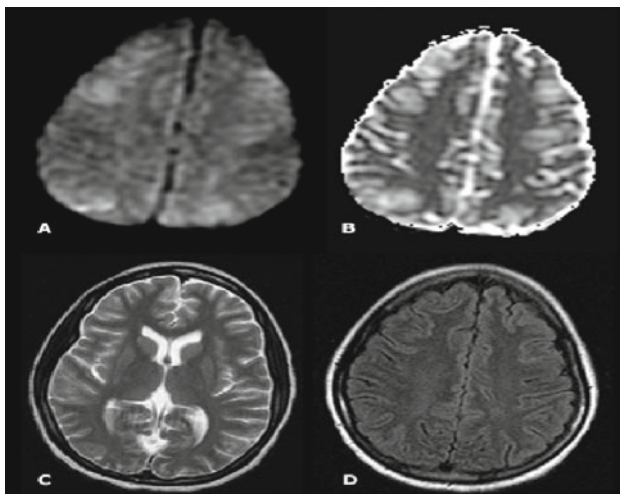


**Case 04**

Postpartum eclampsia patient who 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 patient was found to have PRES. Patient treated on mannitol and steroids; her condition improved over 15 days.



**Gyriform enhancement**



**Resolution after 2 weeks**

**Conclusion**

Eclampsia is a major cause of maternal mortality in India along with haemorrhage 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, 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 patient's 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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