Management of eclampsia in the accident and emergency department

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Abstract
Eclampsia is defined as the occurrence of seizures in pregnancy or within 10 days of delivery, accompanied by at least two of the following features documented within 24 hours of the seizure: hypertension, proteinuria, thrombocytopenia or raised aspartate amino transferase. Eclampsia complicates approximately one in 2000 pregnancies in the United Kingdom and it remains one of the main causes of maternal death.

Up to 38% of cases of eclampsia can occur without premonitory signs or symptoms of pre-eclampsia—that is, hypertension, proteinuria, and oedema. Only 38% of eclamptic seizures occur antepartum; 18% occur during labour and a further 44% occur postpartum. Rare cases of eclampsia have occurred over a week after delivery.

Outcome is poor for mother and child. Almost one in 50 women suffering eclamptic seizures die, 23% will require ventilation and 35% will have at least one major complication including pulmonary oedema, renal failure, disseminated intravascular coagulation, HELLP syndrome, acute respiratory distress syndrome, stroke, or cardiac arrest. Stillbirth or neonatal death occurs in approximately one in 14 cases of eclampsia.

Up to one third of eclamptic seizures occur out of hospital. For this reason, initial management may involve accident and emergency departments. Early involvement of senior obstetric staff is crucial. Optimal emergency management of seizures, hypertension, fluid balance and subsequent safe transfer is essential to minimise morbidity and mortality.

Definition
An early definition of eclampsia was the occurrence of seizures in the presence of pre-eclampsia (shown by hypertension, proteinuria, and oedema occurring after 20 weeks’ gestation). Current definitions place less reliance on the presence of pre-eclampsia as eclampsia can develop without preceding symptoms or signs in up to 38% of cases.

The UK Eclampsia Trial1 definition consisted of: Seizures occurring in pregnancy or within 10 days of delivery and with at least two of the following features documented within 24 hours of the seizure:
- Hypertension diastolic blood pressure (DBP) of at least 90 mm Hg (if DBP less than 90 mm Hg on booking visit) or DBP increment of 25 mm Hg above booking level.
- Proteinuria one “plus” or at least 0.3 g/24 h.
- Thrombocytopenia less than 100 000/µl.
- Raised aspartate amino transferase (AST) greater than 42 IU/l.

Eclampsia is a pregnancy specific, multi-organ disorder. The main features are hypertension, proteinuria, and generalised oedema occurring after 20 weeks’ gestation. Other common features include haemoconcentration, hypoalbuminaemia, hepatic dysfunction, coagulation problems and hyperuricaemia. Pre-eclampsia usually regresses within 48 hours of delivery. Hypertension in this setting is usually taken as DBP 15 mm Hg higher than DBP in early pregnancy. If previous values are not known, a blood pressure of greater than 140/90 mm Hg is considered significant. Table 1 shows indicators of severe pre-eclampsia.

Pre-eclampsia may progress to eclamptic seizures without warning, although the above features may herald the onset of fits.

Table 1: Indicators of severe pre-eclampsia

<table>
<thead>
<tr>
<th>Feature</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Systolic blood pressure</td>
<td>&gt;160 mm Hg</td>
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<tr>
<td>DBP</td>
<td>&gt;110 mm Hg</td>
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<tr>
<td>Proteinuria</td>
<td>++ or +++</td>
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<tr>
<td>Serum creatinine</td>
<td>&gt;1.2 mg/dl</td>
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<tr>
<td>Platelets</td>
<td>&lt;100 000/µl</td>
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<td>Increased AST or ALT</td>
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<tr>
<td>Epigastric pain</td>
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<tr>
<td>Headache, other cerebral or visual symptoms</td>
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<tr>
<td>Retinal exudates, haemorrhages, or papilloedema</td>
<td></td>
</tr>
<tr>
<td>Pulmonary oedema</td>
<td></td>
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</tbody>
</table>

References
1. The UK Eclampsia Trial.
Incidence
A prospective descriptive survey of every case of eclampsia in the UK was carried out in 1992. Two hundred and seventy nine consultant led obstetric units were surveyed. Five hundred and eighty two possible cases were reported and 383 were subsequently confirmed as cases of eclampsia. This gave a rate of 4.9 per 10 000 maternities. This incidence is similar to that reported in the USA in 1983–1986 of 4.3 per 10 000. Sixty eight per cent of seizures occurred in hospital; 44% were postpartum; 18% were intrapartum. The remainder were antepartum.
Of the postpartum cases, 20 seizures occurred more than 48 hours after delivery and three occurred after seven days.

Pathophysiology
Pre-eclampsia/eclampsia is thought to result from abnormal placental development. Major pathological changes occur in the placental vascular bed resulting in placental ischaemia. An alteration in the ratio of prostacyclin and thrombomucine occurs along with platelet aggregation, thrombin activation, and fibrin deposition in maternal systemic vascular beds. Increased capillary permeability and hypoalbuminaemia also occur. A combination of profound vasospasm and thrombosis causes dys-function of almost all organ systems.

Pre-disposing factors for pre-eclampsia include nulliparity, multiple gestations, extremes of age (teenagers three times more likely than older women), diabetes mellitus, hydatidiform mole, fetal hydrops, and family history. In pre-eclampsia, there are exaggerated responses to angiotensin II, catecholamines, and vasopressin. Intravascular volume is reduced. Seizures are thought to be the result of cerebral vasospasm and endothelial damage leading to ischaemia, microinfarcts, and oedema.

Bleeding time is frequently increased in severe pre-eclampsia, although standard coagulation tests such as prothrombin time and partial thromboplastin time may be normal. The cause of this is uncertain but increased levels of von Willebrand’s factor and other unknown substances may be implicated.

Presentation of eclampsia
In the UK Eclampsia Trial, 18% of women suffering eclamptic seizures were parous and had no previous history of pre-eclampsia or eclampsia. Seizures were significantly more likely in teenagers and those with multiple pregnancies—that is, twins, triplets, etc. Making a diagnosis of pre-eclampsia in the A&E department may be difficult as the features of hypertension, proteinuria, and oedema can occur individually as part of other diseases and in normal pregnancy. Table 2 summarises the incidence of proteinuria, hypertension, and symptoms before the onset of seizure. Thirty eight per cent had their first fit outside the hospital and 49% of women with eclampsia had multiple seizures. A recent case series suggested that all women at more than 20 weeks’ gestation presenting with epigastric or right upper quadrant pain should have their blood pressure checked and urine analysis performed.

Table 3 details the differential diagnosis of seizures in pregnancy.

Complications
In the UK Eclampsia Trial, 1.8% of patients died and 35% had at least one major complication (see table 4).

Preterm and antenatal eclampsia seem to be the most severe. Stillbirth and neonatal death rates were 22.2 and 34.1 per 1000 deliveries respectively. Overall, one in 14 offspring of women with eclampsia died.

In the UK, cerebral haemorrhage is the most common cause of death in eclampsia and pre-eclampsia. The cerebral manifestations are similar to hypertensive encephalopathy with thrombosis and fibrinoid necrosis of cerebral arterioles, diffuse microinfarcts, and petechial haemorrhages in the brain. However, approximately 20% of women with eclampsia have a systolic blood pressure of less than 140 mm Hg or a DBP of less than 90 mm Hg around the time of the seizure. Retinal changes of hypertensive encephalopathy are rarely seen.

As intravascular volume depletion is accompanied by intense vasospasm, these patients are at increased risk of pulmonary oedema from excessive fluid replacement. Conversely, they are at risk of hypovolaemia even from the normal blood loss associated with delivery.

Pulmonary oedema may be attributable to a combination of increased capillary permeability, low colloid osmotic pressure, and pulmonary endothelial damage. Renal complications...
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Table 5 Immediate management of eclampsia

- Summon senior A&E and obstetric staff
- Secure airway and administer high flow oxygen
- Place wedge under right hip or nurse in left lateral position
- Secure intravenous access and draw blood for FBC, U&Es, LFTs, clotting screen, cross match, and Kleihauer test if abruption suspected
- Control seizures
- Control hypertension
- Monitor vital signs including BP, ECG, RR, SaO2 and fetal heart rate
- Catheterise bladder, monitor urine output, and test urine for protein

Table 6 Drug treatment in eclampsia

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Onset</th>
<th>Side effects</th>
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<tr>
<td>Diazepam or Lorazepam</td>
<td>5–10 mg slow iv bolus or 2–4 mg slow iv bolus</td>
<td>Loss of patellar reflexes, drowsiness, shuffling of speech, flushing, muscle weakness, respiratory depression</td>
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<tr>
<td>Magnesium sulphate</td>
<td>4–6 g slow iv bolus over 5 minutes then 1–2 g/h iv infusion</td>
<td>Headache, tremor, nausea, vomiting, tachycardia</td>
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<tr>
<td>Blood pressure control</td>
<td>Hydralazine 5 mg slow iv bolus every 20–30 min 10 min or Labetalol 10 mg slow iv bolus doubling every 10–20 min to max 300 mg total or 1–2 mg/min iv infusion</td>
<td>Headache, tremor, nausea, vomiting, tachycardia</td>
<td></td>
</tr>
<tr>
<td>Fluids</td>
<td>Crystalloid 1–2 ml/kg/h with monitoring of urine output</td>
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include glomerular swelling and fibrin deposition resulting in glomerular capillary endotheliosis. Oliguria is common and this can progress to acute tubular necrosis.

Hepatic dysfunction may result from periportal hepatic necrosis, subcapsular haemorrhages or fibrin deposition in hepatic sinuses. In very rare cases, fatal hepatic rupture may occur. Hepatic dysfunction may form part of the HELLP syndrome, which complicates 0.3% of all pregnancies and up to 20% of women with severe pre-eclampsia. The syndrome comprises haemolysis, increased liver enzymes, and low platelets with epigastric or right upper quadrant pain. This represents a life threatening complication and requires prompt delivery.

Disseminated intravascular coagulation occurs in 7% of patients with eclampsia but the cause is unclear.

Fetal complications are thought to arise as a result of placental hypoperfusion. These include high fetal loss rate, intrauterine growth retardation, small for dates infants and increased perinatal mortality. The oxyhaemoglobin dissociation curve is shifted to the left in pre-eclampsia, reducing oxygen delivery to the fetus.

Placental abruption may accompany eclampsia.

Aims of treatment

Management of pre-eclampsia/eclampsia consists of prevention or treatment of seizures, control of blood pressure and ultimately, delivery of the infant. Table 5 summarises immediate management of eclampsia.

Sixty per cent of maternal deaths in this condition are attributable to cerebral haemorrhage and a blood pressure of more than 170/110 mm Hg should be treated urgently but maintained above 130/90 mm Hg to avoid acute reduction of placental perfusion. Delivery is indicated urgently if there is evidence of severe, progressive disease such as headache, blurred vision, scotomata, episcleritis, greater than 110 mm Hg, clonus, coagulopathy, raised creatinine, or liver enzymes. Table 6 summarises drug treatment of eclampsia.

CONTROL OF SEIZURES

Previous studies in the UK reported diazepam and phenytoin as the drugs of choice for treatment of eclamptic seizures. Both were commonly used and effective in the treatment of other forms of seizure and phenytoin had the advantage of having little sedative effect. First line measures to control seizures remain diazepam or diazemuls 5–10 mg, or lorazepam 2–4 mg given as a slow intravenous bolus. Chlormethiazole has largely been abandoned because of risks of oversedation, loss of airway reflexes, respiratory depression, and fluid overload. By comparison, magnesium sulphate has been first line treatment in the USA and Southern Africa for many years and is gaining acceptance as the treatment of choice in the UK.

The Collaborative Eclampsia Trial was an international multicentre randomised trial involving 1680 women with eclampsia. The trial was divided into two arms. The first compared magnesium sulphate with diazepam and the second compared magnesium sulphate with phenytoin in the prevention of recurrent seizures. Maternal and neonatal morbidity and mortality were the outcome measures. Table 7 summarises the results.

This study concluded that magnesium sulphate should be the drug of choice for eclampsia. Phenytoin appeared to cause more...
maternal and neonatal morbidity and diazepam and phenytoin were associated with increased recurrence of seizures compared with magnesium sulphate.

Magnesium sulphate does not seem to be an anticonvulsant but is known to be a potent cerebral vasodilator. It is thought to reverse cerebral vasodilatation by blocking calcium influx through the NMDA (N-methyl-D-aspartate) subtype of the glutamate channel. Two prospective, randomised, controlled trials using cranial Doppler ultrasound examination of cerebral blood flow have supported this explanation. Magnesium sulphate may also have a role in the prophylaxis of seizures in pre-eclampsia. Magnesium sulphate is administered in a loading dose of 4 to 6 g given as a slow intravenous bolus (for example, four 2 ml ampoules of 50% solution made up to 20 ml with 5% dextrose or sterile water, given over five minutes). This loading dose should be followed by a maintenance infusion of 1 to 2 g per hour. The patient should be monitored carefully for clinical signs of magnesium toxicity, particularly loss of patellar reflexes, drowsiness, flushing, slurring of speech, muscle weakness and respiratory depression, which may herald respiratory (or cardiorespiratory) arrest. Level of consciousness, respiratory rate and effort and the presence of patellar reflexes should be frequently and regularly recorded during the infusion. If toxicity is suspected, the infusion should be discontinued and if required, calcium gluconate (10 ml of 10% solution) should be given. Magnesium sulphate increases sensitivity to non-depolarising neuromuscular blocking agents such as vecuronium. Fasciculations may not occur after suxamethonium.

CONTROL OF BLOOD PRESSURE
Hydralazine is known to be effective for controlling hypertension in pre-eclampsia/eclampsia. After an intravenous bolus, effects are seen by 10 minutes and are maximal by 20 minutes. Its duration of action is six to eight hours. Side effects include hypotension, tachycardia, tremor, headache, nausea, and vomiting. Unfortunately, this may mimic impending eclampsia. Neonatal thrombocytopenia has also been reported in association with the use of hydralazine. Labetalol is being used more frequently in the treatment of eclampsia, demonstrated normal or high cardiac output in the presence of normal wedge and central venous pressure, and inappropriately high systemic vascular resistance. It concluded, that because filling pressures were normal, fluid should be given cautiously to avoid precipitating pulmonary oedema. Hypotension and fetal distress have been reported in pre-eclamptic patients given epidural analgesia or hydralazine without prior fluids. In view of the increased risk of pulmonary oedema, a suggested fluid regimen is of crystalloids given at 1–2 ml/kg/h with careful monitoring of urine output.

UGRNT TRANSFER
Arrange urgent transfer to an obstetric unit for delivery.

Conclusion
Eclampsia remains a major cause of maternal and fetal morbidity and mortality in the UK. Up to one third of cases may present to the A&E department. A variety of presentations may occur. The diagnosis needs to be considered in any patient at more than 20 weeks gestation with any suspicious features. Prompt recognition and appropriate management minimises morbidity and mortality for both mother and child. In view of recent changes in the treatment of eclampsia, A&E departments, together with their local obstetricians, should review their treatment guidelines and ensure the appropriate drugs are readily available.

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National Horizon Scanning Centre (NHSC)
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