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Magnesium toxicity complicating a rare presentation of severe pre-eclampsia

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Introduction

Pre-eclampsia is a heterogenous multisystem disorder that complicates approximately 5% of all pregnancies worldwide.[1] It is characterised by widespread endothelial dysfunction and its diagnosis requires the new onset of hypertension and proteinuria or hypertension and significant end-organ dysfunction with or without proteinuria after 20 weeks' gestation in a previously normotensive woman.[1]

Magnesium sulphate has long been used for seizure prophylaxis in the treatment of pre-eclampsia and is generally considered an effective and well-tolerated therapeutic agent.[2] However, magnesium toxicity is a serious and potentially life-threatening complication that requires regular clinical assessment as well as a high index of suspicion to allow for prompt recognition and treatment.

Case report

We present the case of a previously healthy 39-year-old parturient at 35 weeks' gestation who presented to the emergency department with a one hour history of headache, slurred speech, right-sided facial swelling and droop with right-sided hemiparesis. Her blood pressure on arrival was 167/76 mmHg with 1+ protein found on urine dipstick.

Initial CT brain showed no evidence of acute infarct or intracranial abnormality and she was commenced on magnesium sulphate and labetalol infusions for management of severe preeclampsia as per hospital protocol. On arrival to theatre for an emergency caesarean section 2 hours later, her blood pressure had stabilised and focal neurological symptoms had greatly improved, yet she was noted to be nauseous with worsening drowsiness, deteriorating respiratory function and significant hypotension.

It was then discovered that, due to an iatrogenic error, she had received a large bolus dose of magnesium and was developing symptomatic toxicity. The infusion was stopped immediately and she was treated with 10 mL of 10% calcium gluconate.

She ultimately delivered a healthy baby boy with complete resolution of her neurological symptoms and no adverse outcomes from the magnesium toxicity. Follow-up MRI brain confirmed no significant intracranial abnormalities and after consultation with stroke services, it was felt that given the reversibility of her symptoms a diagnosis of posterior reversible encephalopathy syndrome secondary to an episode of severe preeclampsia was the most likely diagnosis.

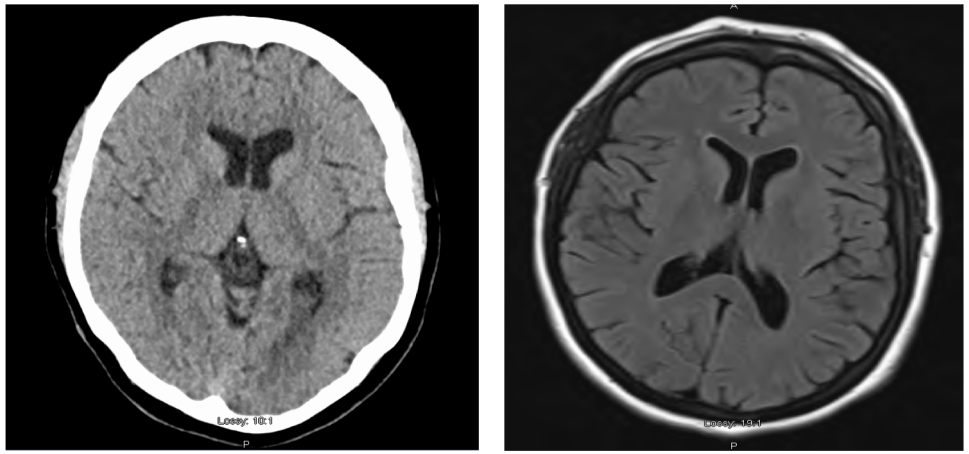


Fig. 1 & 2; Axial images of initial CT Brain and follow up MRI Brain confirming no evidence of infarct or haemorrhage.

Discussion

This case highlights the many complications that may arise from pre-eclampsia. Headache, visual changes, altered mental status and ultimately seizures are the most commonly reported neurological manifestations, but it has also been shown to be a causative factor in rare cerebrovascular disorders such as posterior reversible encephalopathy syndrome. This is caused by vasogenic oedema due to loss of integrity of the blood-brain barrier

This case also illustrates the dangers of magnesium toxicity and the steps involved in its management. Serum levels of 2-3.5mmol.l^{-1} have classically been quoted as the ideal therapeutic range, but toxicity occurs at levels > 3.5mmol.l^{-1} with loss of patellar tendon reflexes, nausea and lethargy. This is followed by the onset of respiratory paralysis at levels >5mmol.l^{-1}, the development of cardiac arrhythmias at >7.5mmol.l $^{-1}$ and ultimately cardiac arrest when levels exceed 12mmol.l^{-1}.

Finally, it presents an opportunity to reflect on the many human factors that can potentially cause iatrogenic errors in high-stress situations and the tools we can use to overcome such cognitive overload.

References

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3. McDermott M, Miller EC, Rundek T, et al. Preeclampsia: association with posterior reversible encephalopathy syndrome. Stroke 2018; 49: 524-30