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SHORT REPORT



## Simultaneous decompressive craniectomy and caesarean section

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### ABSTRACT

A 24-year-old primigravid woman at 29-weeks gestation presented with headache, hypertension and proteinuria. A diagnosis of pre-eclampsia was made. Later that day she developed a left hemiparesis and neuroimaging demonstrated an intracerebral haemorrhage in the right frontal lobe as well as thrombosis of the superior sagittal sinus. She was commenced on an IV heparin infusion to manage the sinus thrombosis, and nifedipine and labetalol to treat the hypertension. GCS remained 15/15. However, 12 hours later, she became progressively agitated. Her GCS decreased to 10/15 (E3V2M5). Repeat imaging demonstrated enlargement of the haematoma, causing significant mass effect and midline shift. A decision was made to perform decompressive hemicraniectomy to save the life of the mother, and caesarean section to protect the foetus as well as providing definitive treatment of pre-eclampsia. Due to further neurological deterioration of the mother it became necessary to perform the two procedures simultaneously. We present the first reported case of decompressive craniectomy and caesarean section performed simultaneously. After discussing the case, we consider why this clinical scenario is rare and why it became necessary in this patient to perform the two procedures simultaneously.

### ARTICLE HISTORY

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### KEYWORDS

Obstetrics; decompressive craniectomy; raised intracranial pressure; venous sinus thrombosis

### Introduction

Decompressive craniectomy is a life-saving neurosurgical intervention to treat raised intracranial pressure (ICP) where medical management fails. Common indications are in the management of severe traumatic brain injury (TBI)<sup>1,2</sup> and cerebral infarction.<sup>3</sup>

Emergency caesarean section is performed when complications of labour threaten the life of the mother or baby. The Royal College of Obstetricians and Gynaecologists classifies caesarean section by its urgency: Category 1 cases pose immediate threat to the lives of the mother or foetus, Category 2 cases have maternal or foetal compromise which is not immediately life-threatening, Category 3 cases require early delivery but have no maternal or foetal compromise, and Category 4 cases are planned at a time to suit the patient and maternity services.<sup>4</sup>

We report a case of pre-eclampsia and Cerebral Venous Sinus Thrombosis (CVST) occurring in the third trimester, with cerebral venous infarction and haemorrhagic transformation leading to progressively raised intracranial pressure (ICP). This eventually necessitated simultaneous emergency caesarean section and decompressive craniectomy.

### Case presentation

A 24-year-old primigravid woman of 29 weeks gestation presented with headache. She was found to have hypertension and proteinuria (0.81g/L), and a diagnosis of pre-eclampsia was made. Foetal ultrasound was reassuring.

Within 24h she deteriorated, developing a left hemiparesis and seizures. A CT scan and venogram demonstrated thrombosis of the superior sagittal sinus and a right frontal intracerebral

haematoma, presumed to be haemorrhagic transformation of a venous infarct.

She was commenced on nifedipine, labetalol and an IV heparin infusion and admitted to Neuro Critical Care.

Approximately twelve hours later, the patient's GCS decreased to 10/15 (E3V2M5), with sluggish pupils. Repeat CT demonstrated enlargement of the right frontal haematoma with increased mass effect and midline shift.

### Treatment

Given the progressive neurological deterioration and worsening radiological appearances, together with increasing concern for the foetus, a decision was made to deliver the foetus and perform decompressive craniectomy.

Although the patient now lacked capacity, there had been a pre-emptive discussion, on admission to Neuro Critical Care, between the obstetric team and the patient about the possibility of needing to deliver the baby as an emergency, were her condition to deteriorate.

Her family was updated and the patient was intubated and transferred to the emergency theatre. Protamine was given to reverse the heparin.

Mannitol was given, but upon arrival in theatre, the patient's right pupil had become unreactive, and so the decision was made to perform both procedures immediately.

The patient was placed supine on the operating table. A sterile partition separated the two operative fields, and the two separate surgical teams performed the procedures simultaneously. The baby was delivered with normal APGAR scores, received by the neonatal team in theatre, and then admitted to the neonatal unit. Post-operatively the mother returned to Neuro Critical Care.

### Outcome and Follow-Up

At one week post-op, the mother was GCS 15 but had a severe left hemiparesis (MRC Grade 1/5).

At two weeks post-op the patient was discharged, on a six-month course of warfarin.

At follow-up at four months, the patient had recovered 4/5 power in the left leg and was able to stand unaided. The baby remained well throughout.

### Discussion

Pre-eclampsia affects approximately 3-6% of all pregnancies.<sup>5</sup> It occurs after the 20<sup>th</sup> week of gestation and is characterised by hypertension with proteinuria. Pre-eclampsia is associated with high risks of preterm delivery, intrauterine growth restriction, placental abruption, and perinatal mortality.<sup>5</sup> Management involves close monitoring of the patient and foetus, treatment of hypertension, and the prevention of eclampsia with magnesium sulphate. Delivery remains the definitive treatment.<sup>6</sup>

Cerebral venous sinus thrombosis (CVST) is the presence of thrombi in the dural venous sinuses of the brain. It is a rare condition with an incidence of approximately 2 to 5 per million per year.<sup>7</sup> Pregnancy is a known risk factor due to its hypercoagulable state.<sup>8</sup> A systematic review in 2006 showed that mortality of CVST was about 9.4%, with 88% of survivors making a total or near-total recovery.<sup>9</sup> Poor prognostic indicators of CVST include those aged over 37 years, altered mental status, intracerebral haemorrhage and thrombosis of the deep cerebral venous system.<sup>10</sup>

Anticoagulation treatment is the mainstay of treatment for CVST. Though this may carry a potential risk of haemorrhage,<sup>11</sup> patients with CVST are still recommended heparin treatment on the basis that anticoagulation prevents further thrombus formation, and also facilitates recanalisation of vessels and reperfusion of ischaemic tissues.<sup>12</sup>

There is insufficient data regarding which heparin treatment (unfractionated or low molecular weight heparin) is superior for CVST. However, studies looking at extracranial venous thrombosis have shown that low molecular weight heparin (LMWH) is associated with lesser major bleeding compared with unfractionated heparin.<sup>13</sup> It is unclear whether this conclusion can be translated to the management of intracranial venous thrombosis. It should also be noted that the reversibility of LMWH with protamine is less effective as compared to that of unfractionated heparin.<sup>14</sup>

The incidence of decompressive craniectomy is relatively uncommon in younger women, given the lower incidence of stroke and TBI, compared with older or male patients.<sup>15,16</sup>

In this case, a combination of obstetric phenomena, namely hypercoagulability and pre-eclampsia, created a 'perfect storm' which eventually led to simultaneous decompressive craniectomy and emergency caesarean section.

The hypercoagulability of pregnancy led to CVST, with secondary venous infarction, intracerebral haemorrhage, cerebral oedema and rising ICP. Anticoagulation was commenced to treat

the CVST, which with the underlying pre-eclampsia increased the risk of the intracerebral haematoma enlarging. As the haematoma enlarged, ICP rose further, leading to coma, as well as foetal distress. Decompressive craniectomy was performed to save the life of the mother, whilst caesarean section delivered the foetus and treated the pre-eclampsia.

### Conclusion

The authors believe this to be the first reported case of simultaneous decompressive craniectomy and caesarean section. They were done as a result of rising ICP, pre-eclampsia and foetal distress. There was a successful response, with good outcomes for both the mother and baby.

### Disclosure statement

The authors report no conflict of interest.

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