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CASE REPORT

Acute normovolemic hemodilution, intraoperative cell salvage and PulseCO hemodynamic monitoring in a Jehovah's Witness with placenta percreta

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KEYWORDS
Acute normovolemic hemodilution; Cell salvage; Cell saver; Cesarean hysterectomy; Jehovah's Witness; Placenta percreta; Obstetric hemorrhage; Oxytocin; Pulse power analysis; PulseCO; LiDCO; Cardiac output

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Summary A Jehovah's Witness who had had four previous cesarean deliveries was referred to our institution for management of a complete placenta previa at 34 weeks of gestation. A subsequent ultrasound scan was suggestive of placenta percreta with bladder involvement. After erythropoietin and iron supplementation, cesarean hysterectomy was performed. Using PulseCO technology for continuous hemodynamic monitoring, preoperative acute normovolemic hemodilution and intraoperative cell salvage were used resulting in a successful cesarean hysterectomy with a 5500-mL estimated blood loss. The PulseCO system provides continuous, real-time hemodynamic data by applying pulse power analysis to the arterial pressure waveform. A bolus of oxytocin given after delivery produced profound hypotension, the hemodynamics of which were elucidated with the PulseCO system. To our knowledge, the combined use of acute normovolemic hemodilution, intraoperative cell salvage and PulseCO hemodynamic monitoring for cesarean hysterectomy has not been reported previously. These techniques may be particularly useful in managing patients who refuse blood products and/or in whom the baseline hemoglobin is suboptimal.

Introduction

Life-threatening intraoperative hemorrhage is a known and feared complication of placenta percreta. Patients who refuse blood transfusion, for religious or other reasons, present an additional challenge for anesthetic management. Well-planned strategies for blood conservation and decisive surgical technique can help to achieve an acceptable outcome.

Case report

A 42-year-old, 100-kg woman, gravida 6, para 4, who had had four previous cesarean deliveries, was referred to our institution at 34 weeks of gestation for management of placenta previa. Ultrasound was highly suggestive of placenta percreta with bladder involvement.

The patient was a Jehovah's Witness who adamantly refused transfusion of blood products and expressed full understanding of the consequences of this decision. She said she would accept erythropoietin

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injections and oral iron. Erythropoietin 30 000 units was given subcutaneously daily, from four days before surgery until nine days after, with the exception of the day of surgery. Ferrous sulfate 325 mg was given orally for five doses from four days before surgery until and including the day of surgery.

Further discussion with the patient and her religious advisors revealed that she would accept crystalloid and colloid solutions, vasopressors, and autologous transfusion via a continuous circuit which did not lose its connection with her body, including both acute normovolemic hemodilution and cell salvage techniques.

At 34 weeks and four days, when the packed cell volume (PCV) was 33.8% (no hemoglobin was reported), it was felt that the risk of antepartum hemorrhage outweighed the benefit of further observation and treatment. Cesarean hysterectomy, therefore, was scheduled for the following day, when the most senior and experienced gynecological surgeon and the hospital's most experienced cellsaver technician could both be present.

A 16-gauge intravenous cannula was placed in each forearm. The patient was given sodium citrate 30 mL orally and famotidine 20 mg, metoclopramide 10 mg and midazolam 2 mg i.v. before being taken to the operating room. A 20-gauge right radial arterial line was inserted and the PulseCO system (LiDCO Ltd, Cambridge, UK) connected for hemodynamic monitoring by means of pulse power analysis.[1] In the interest of time the system was not calibrated with lithium, and was merely used to follow hemodynamic trends, including nominal values for systemic vascular resistance (SVR) and cardiac output (CO) based on the patient's age, height and weight. Heart rate, mean arterial pressure (MAP) and key events during surgery are shown in Fig. 1.

A baseline arterial blood sample showed a starting hemoglobin (Hb) of 11.7 g/dL. An 8.5 Fr right internal jugular venous sheath was placed for the purpose of taking blood for acute normovolemic hemodilution (ANH) and for subsequent blood and fluid administration, after which 1200 mL of blood was removed via the central line into standard citrate phosphate dextrose (CPD) storage bags, which remained in a closed circuit with the patient throughout the operation. During the 15 minutes of blood removal, hetastarch 500 mL and approximately 2000 mL of Normosol-R (a balanced crystalloid solution) were given to maintain normovolemia. All fluids and blood were passed through fluid warmers. Phenylephrine, in bolus doses of 25-50 μg, was given as necessary to maintain maternal blood pressure during hemodilution. Left uterine displacement was maintained during the procedure until the birth of the baby. There was no change in fetal heart rate during ANH. After ANH was complete, an arterial blood sample revealed a Hb of 10.2 g/dL.

Following preoxygenation and i.v. administration of fentanyl 100 μg, anesthesia was induced at 0901 with propofol 100 mg, ketamine 50 mg and succinylcholine 100 mg. Cricoid pressure was applied during induction. Anesthesia was maintained with desflurane in oxygen and air. Skin incision was delayed until 0915. Rocuronium 30 mg was administered at 0920 for muscle relaxation.

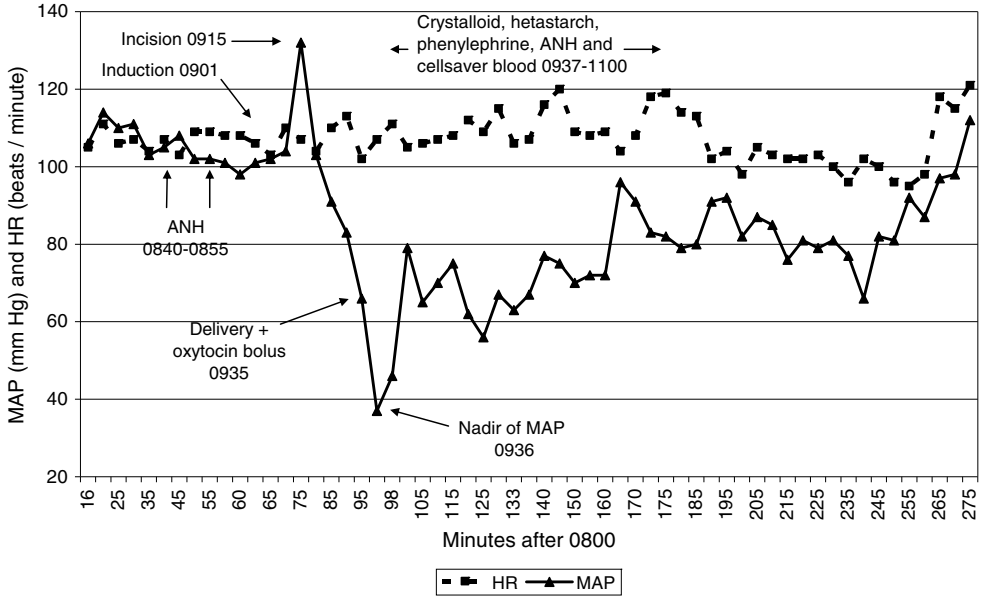

Figure 1 Heart rate (HR), mean arterial pressure (MAP) and key events during cesarean hysterectomy.