Clinical Report

Carbetocin as a uterotonic in a parturient with a Fontan circulation

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Introduction

Women with univentricular circulations and subsequent Fontan palliation have high rates of post-partum haemorrhage (PPH), causing hypovolaemia and hypotension, with reduced pulmonary blood flow and hypoxia [1–3]. Intravenous oxytocin can cause hypotension and reactive tachycardia due to vasodilation. Many experts, therefore, recommend a low-dose `cardiac´ oxytocin bolus and infusion as the default post-partum uterotonic regimen in any woman with heart disease [4].

Carbetocin is an oxytocin analogue with a long half-life, which reduces the need for further uterotonics [5]. We are unaware of any previous reports of carbetocin use in cardiac disease. Here, we describe the use of carbetocin in a patient with total cavo-pulmonary connection (TCPC) Fontan palliation. We opted for this approach because we thought that the patient would tolerate carbetocin in combination with an inotrope or vasoconstrictor, and this would represent a lower risk than hypovolaemia and hypotension from post-partum haemorrhage.

Report

A 36-year-old woman with a Fontan circulation presented for a category 3 caesarean section at 33 weeks of gestation. She had good single ventricle function and her resting oxygen saturation was 90% on air. She had an instrumental delivery for her first child under epidural analgesia; during that procedure, she suffered significant blood loss and a peri-arrest episode. She had an uncomplicated caesarean section under combined spinal epidural anaesthesia for her second child.

We chose carbetocin as the uterotonic for her caesarean section, given the history of peri-arrest after haemorrhage. We placed two 16-g intravenous canulae and a radial arterial line for continuous blood pressure monitoring. We initiated a low-dose combined spinal epidural block using 1.5 ml (7.5 mg) of 0.5% hyperbaric bupivacaine intrathecally, which achieved adequate anaesthesia to start the procedure. We gave Hartmann's solution to maintain euvolaemia. We administered 11 boluses of phenylephrine 50 μg for vasopressor support, to counteract the hypotensive effects of regional anaesthesia. We gave 1 g of tranexamic acid intravenously. Table 1 shows the patient's blood pressure readings.

After delivery, we gave 100 μg carbetocin intravenously over 18 min. We gave three doses of 50 μg phenylephrine during, and four more doses after completion of the carbetocin infusion. The total blood loss was 650 ml, and we infused 2200 ml of Hartmann's solution over 105 min. The patient remained cardiovascularly stable throughout.

Following delivery, we transferred the patient to our labour ward high dependency unit for continued arterial blood pressure monitoring. She did not suffer any complications. Her postoperative haemoglobin was 119 $g.l^{-1}$.

Table 1 The patient's observations and key events over the course of the procedure.

Time (24 h clock)	Blood pressure (mmHg)	Heart rate (beats.min^{-1})	Arterial oxygen saturation on oxygen 4 l.min^{-1} via facemask	Events	Phenylephrine 50 μg bolus	Hartmann's solution
13.00	160/85	50	99		13.04	First litre 13.00–13.22
13.05	160/85	50	99		13.05	
13.10	150/80	50	99	Spinal 13.07	13.09 13.11 13.14	
13.15	140/55	45	99	Epidural 0.5% levobupivacaine 3 ml at 13.15	13.18	
13.20	152/70	50	98		13.21	Second litre 13.22–13.55
13.25	135/65	55	98	Incision 13.22	13.25	
13.30	153/70	45	98	Epidural 0.5% levobupivacaine 2 ml at 13.30	13.28	
13.35	140/60	50	98	Epidural 0.5% levobupivacaine 5 ml at 13.35	13.33 13.39	
13.40	135/70	50	98	Delivery 13.41 Carbetocin 100 μg from 13.42 to 14.00	13.43	
13.45	145/70	50	98		13.46	
13.50	140/70	48	98		13.50	
13.55	140/70	48	98		13.59	200 ml 13.55–14.45
14.00	150/65	45	98		14.04	
14.05	140/70	45	97		14.09	
14.10	150/70	45	97		14.11	
14.15	140/70	45	97		None	
14.20	140/65	48	97		None	
14.25	130/65	45	97		None	
14.30	130/65	48	97		None	
14.35	130/70	48	96		None	
14.40	125/65	48	96		None	Total 2.2 l Hartmann's solution
14.45	130/70	48	96		None	Estimated total blood loss 650 ml
					Total 18 doses = 900 μg	

Discussion

Modifications of the Fontan circulation, now known as the TCPC, are so successful that survival is 90% at 10 years. Pregnant women with TCPC are presenting with increasing frequency.

The risk factors for PPH in this patient were previous PPH, advanced maternal age and operative delivery. Even moderate PPH can be life-threatening in patients with a Fontan circulation.

Ergometrine and carboprost cause coronary and pulmonary vasoconstriction. They are contraindicated in women with cardiac disease. Oxytocin and carbetocin are negative inotropes and peripheral vasodilators. Oxytocin is given as a low-dose infusion to avoid hypotension. However, low-dose oxytocin can be ineffective: 21% of mothers with univentricular circulations treated with low-dose oxytocin infusions had a post-partum haemorrhage of more than 1.5 litres [2].

Our prime objective was to avoid PPH because of the peri-arrest she had in her first delivery. We gave a full dose (100 μg) of carbetocin as a slow infusion, with vasopressor support. This maintained cardiovascular stability and prevented uterine atony and PPH.

The use of carbetocin is novel in cardiac cases. This case shows that it can be used safely as a uterotonic during caesarean section in a patient with a Fontan circulation. There is a risk of hypotension with carbetocin, but the risk of undertreating PPH is more serious.

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