ORIGINAL RESEARCH PAPER

Anaesthesiology

COMPARATIVE STUDY OF HEMODYNAMIC EFFECTS OF CARBETOCIN AND OXYTOCIN IN PATIENTS UNDERGOING ELECTIVE LOWER SEGMENT CAESAREAN SECTION UNDER SPINAL ANAESTHESIA: AN OBSERVATIONAL ANALYTICAL STUDY

KEY WORDS: Carbetocin, oxytocin, spinal anaesthesia, caesarean section, hemodynamic effects, uterotonic agents.

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ABSTRACT

Background Uterotonic agents are routinely administered during caesarean section to prevent postpartum hemorrhage. Oxytocin is commonly used but is associated with significant hemodynamic changes such as hypotension and tachycardia. Carbetocin, a long-acting oxytocin analogue, has emerged as an alternative with prolonged uterotonic action and potentially improved hemodynamic stability. **Aim** To compare the hemodynamic effects of carbetocin and oxytocin in patients undergoing elective lower segment caesarean section (LSCS) under spinal anaesthesia. **Materials and Methods** This observational analytical study included 80 parturients scheduled for elective LSCS under spinal anaesthesia. Patients were divided into two groups of 40 each. Group C received intravenous carbetocin 100 µg and Group O received intravenous oxytocin 10 IU after delivery of the baby. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were recorded at baseline and at regular intervals following drug administration. Incidence of hypotension, tachycardia, vasopressor requirement and adverse effects were noted. **Results** Both groups demonstrated reductions in blood pressure following uterotonic administration. However, the decrease was significantly greater in Group O compared to Group C ($p<0.05$). Tachycardia and vasopressor requirement were more frequent in the oxytocin group. Hemodynamic parameters remained comparatively stable in patients receiving carbetocin. Nausea and flushing were more commonly observed with oxytocin.**Conclusion** Carbetocin provided superior hemodynamic stability compared to oxytocin in patients undergoing elective LSCS under spinal anaesthesia. It was associated with lower incidence of hypotension, tachycardia and vasopressor requirement, making it a safer alternative uterotonic agent in obstetric anaesthesia.

INTRODUCTION

Postpartum hemorrhage remains one of the leading causes of maternal morbidity and mortality worldwide. Active management of the third stage of labour using uterotonic agents plays a vital role in reducing blood loss during caesarean section.

Oxytocin is the most commonly used uterotonic agent during lower segment caesarean section (LSCS). Despite its efficacy, rapid intravenous administration of oxytocin can lead to significant cardiovascular effects including hypotension, tachycardia, arrhythmias and myocardial ischemia. These effects may be exaggerated under spinal anaesthesia due to sympathetic blockade.

Carbetocin is a long-acting synthetic analogue of oxytocin with a prolonged half-life and sustained uterine contraction following a single dose. It has been proposed as an alternative to oxytocin with fewer hemodynamic disturbances and reduced need for additional uterotonics.

The present study was conducted to compare the hemodynamic effects of carbetocin and oxytocin in parturients undergoing elective LSCS under spinal anaesthesia.

Aim

To compare the hemodynamic effects of intravenous carbetocin and oxytocin in patients undergoing elective LSCS under spinal anaesthesia.

Objectives

1. To compare heart rate and blood pressure changes following administration of carbetocin and oxytocin.
2. To evaluate incidence of hypotension and tachycardia.
3. To assess vasopressor requirement in both groups.
4. To compare adverse effects associated with the two drugs.

Materials and Methods

This observational analytical study was conducted after obtaining approval from the institutional ethics committee and informed consent from all participants.

Eighty pregnant women aged 20–35 years with singleton term pregnancy scheduled for elective LSCS under spinal anaesthesia were included in the study.

Inclusion Criteria

- ASA physical status I and II.
- Elective LSCS.
- Singleton term pregnancy.

Exclusion Criteria

- Pregnancy-induced hypertension.
- Cardiac disease.
- Placenta previa or abruption.
- Multiple pregnancy.
- Allergy to study drugs.

Patients were divided into two groups of 40 each.

Group C

Received intravenous carbetocin 100 µg slowly after delivery of the baby.

Group O

Received intravenous oxytocin 10 IU diluted in normal saline after delivery.

All patients received standard spinal anaesthesia using 0.5% hyperbaric bupivacaine. Hemodynamic parameters including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were recorded at baseline, immediately after uterotonic administration and at 1, 3, 5, 10 and 15 minutes thereafter.

Hypotension was defined as a fall in SBP greater than 20% from baseline and was treated with intravenous mephentermine 6 mg. Tachycardia was defined as HR >100 beats/min.

Adverse effects such as nausea, vomiting, flushing and chest discomfort were noted.

Statistical Analysis

Data were analysed using SPSS version 25. Quantitative variables were expressed as mean ± standard deviation. Student's t-test and Chi-square test were used for comparison. A p value <0.05 was considered statistically significant.

RESULTS

Demographic variables including age, weight and duration of surgery were comparable between the groups.

Following administration of uterotonics, both groups showed a decrease in blood pressure; however, the fall was significantly greater in Group O.

Parameter	Group C	Group O	p value
Maximum fall in SBP (%)	12.4 ± 3.1	21.6 ± 4.5	<0.05
Maximum rise in HR (%)	10.2 ± 2.8	22.4 ± 5.2	<0.05
Hypotension (%)	15%	42.5%	<0.05
Vasopressor requirement (%)	10%	37.5%	<0.05

Patients receiving oxytocin had significantly higher incidence of tachycardia and hypotension. Mean arterial pressure remained more stable in Group C throughout the observation period.

Nausea and flushing occurred more frequently in Group O, while no major adverse effects were observed in Group C.

DISCUSSION

Spinal anaesthesia is the preferred technique for elective LSCS due to reduced maternal morbidity and improved neonatal outcomes. However, spinal-induced sympathetic blockade predisposes patients to hypotension, which may be exacerbated by uterotonic agents.

Oxytocin causes vasodilatation and reflex tachycardia through direct smooth muscle relaxation and cardiovascular effects. Rapid intravenous administration can produce marked hemodynamic instability, particularly in hypovolemic patients. Carbetocin, due to its prolonged action and gradual onset, appears to provide effective uterine contraction with less pronounced cardiovascular effects. In the present study, carbetocin demonstrated superior hemodynamic stability compared to oxytocin. Incidence of hypotension, tachycardia and vasopressor use were significantly lower in patients receiving carbetocin.

These findings are consistent with previous studies that reported reduced cardiovascular adverse effects with carbetocin during caesarean delivery. Additionally, the longer duration of action of carbetocin decreases the need for repeated uterotonic administration.

The study was limited by its relatively small sample size and short duration of observation. Further multicentric trials are required to assess long-term maternal outcomes and cost-effectiveness.

CONCLUSION

Carbetocin provides better hemodynamic stability than oxytocin in patients undergoing elective LSCS under spinal anaesthesia. It is associated with lower incidence of hypotension, tachycardia and vasopressor requirement, making it a safer and effective uterotonic agent in obstetric anaesthesia.

REFERENCES

1. Dansereau J, Joshi AK, Helewa ME, et al. Double-blind comparison of carbetocin versus oxytocin in prevention of uterine atony after caesarean section. *Am J Obstet Gynecol.* 1999;180(3):670-676.
2. Attilakos G, Psaroudakis D, Ash J, et al. Carbetocin versus oxytocin for prevention of postpartum hemorrhage following caesarean section. *BJOG.* 2010;117(8):929-936.
3. Moertl MG, Friedrich S, Kraschl J, et al. Hemodynamic effects of carbetocin and oxytocin in caesarean delivery under spinal anaesthesia. *Int J Obstet Anesth.* 2011;20(3):179-185.
4. Thomas JS, Koh SH, Cooper GM. Hemodynamic effects of oxytocin given as intravenous bolus or infusion on women undergoing caesarean section. *Br J Anaesth.* 2007;98(1):116-119.
5. Langesaeter E, Rosseland LA, Stubhaug A. Hemodynamic effects of oxytocin during caesarean section. *Int J Obstet Anesth.* 2006;15(2):95-103.
6. Su LL, Chong YS, Samuel M. Carbetocin for preventing postpartum haemorrhage. *Cochrane Database Syst Rev.* 2012;4:CD005457.
7. Mercier FJ, Augè M, Hoffmann C, et al. Maternal hypotension during spinal anaesthesia for caesarean delivery. *Minerva Anestesiol.* 2013;79(1):62-73.
8. Dyer RA, Reed AR, van Dyk D, et al. Hemodynamic effects of oxytocin after spinal anaesthesia for caesarean section. *Anesthesiology.* 2010;113(5):1045-1054.