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COMPARATIVE ASSESSMENT OF HEMODYNAMIC EFFECTS OF OXYTOCIN AND CARBETOCIN IN GYNAC SURGERIES

Dr. V. Vijay Sai

Assistant Professor, Department of Anaesthesia, Deccan College of Medical Sciences, Hyderabad, Telangana

Email id: Vullapuvijaysai@gmail.com

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ABSTRACT

Background: Prophylactic uterotonics is the primary preventive measure for PPH, or postpartum hemorrhage, a major cause of maternal death that is mostly linked to uterine atony. As a first-line medication, oxytocin is typically associated with significant hemodynamic instability. Another medication with similar efficacy and superior hemodynamic stability is carbetocin, a long-acting oxytocin analog.

Aim: The goal of this study was to compare the hemodynamic effects of carbetocin and oxytocin in patients undergoing elective cesarean sections or LSCS under spinal anesthesia.

Methods: In the current study, 140 participants undergoing elective caesarean sections at the Institute under spinal anesthesia during the specified study period were evaluated. They were randomly assigned to two groups, Group I receiving a single intravenous dose of carbetocin and Group II receiving oxytocin. Heart rate, diastolic and systolic blood pressure, side effects, predicted postoperative blood loss, and the need for extra uterotonics were all monitored at regular intervals.

Results: Carbetocin was found to have much greater hemodynamic stability than oxytocin (p=0.03), along with a significantly decreased incidence of hypotension. The initial uterine contraction, which was similar in both groups, was used to measure uterotonic efficacy. In the carbetocin and oxytocin groups, the need for uterotonic drugs was 6% and 31%, respectively, and was much lower with oxytocin. The two groups' overall profiles and postoperative blood loss were similar.

Conclusions: The current study shows that carbetocin exhibits better hemodynamic stability than oxytocin while maintaining a similar safety profile and uterotonic effectiveness. Carbetocin considerably reduced the need for rescue uterotonics, which supports its usage as the recommended preventive medication in patients undergoing spinal anesthesia for cesarean sections.

Keywords: Oxytocin, carbetocin, hemodynamic stability, Postpartum hemorrhage and spinal anesthesia

INTRODUCTION

Postpartum hemorrhage, or PPH, is one of the main causes of maternal death worldwide, with uterine atony being the most frequent cause. Therefore, preventive uterotonics medication and active illness treatment during the third stage of labor are typical practices to reduce this risk. This is important since the results for mothers might be greatly impacted by the severe bleeding that occurs in PPH. The effects of the different uterotonics on side effects, maternal hemodynamics, and uterine tone vary.[1]

A thorough understanding of these medications is essential for anesthesiologists who oversee patients during cesarean sections. This covers the effects on hemodynamics, clinical effectiveness, indications, and contraindications. Maintaining alertness, enhancing patient outcomes and safety, managing side effects, and timely identification all depend on this information.[2]

The first uterotonic medication often administered following delivery is oxytocin. The use of oxytocin has been successful in reducing the incidence of postpartum hemorrhage, but it still poses a clinical challenge due to its heat-labile nature and potential inability to maintain a consistent cold chain in real-world settings, which compromises its efficacy compared to ideal circumstances. Additionally, additional uterotonics are typically required to maintain accurate uterine tone. Its brief half-life, which necessitates continual intravenous infusion delivery, is another drawback. Arrythmias, tachycardia, hypotension, nausea, and vomiting are among the dose-dependent adverse effects of oxytocin. In low-risk people, these side effects are treatable; in high-risk subjects, they may be life-threatening and have clinical importance.[3]

In contrast, a single intravenous bolus of carbetocin, a long-acting and heat-stable synthetic counterpart of oxytocin, replaces the requirement for a continuous infusion. According to a number of earlier studies in the literature, carbetocin's uterotonic efficacy is comparable to or better than oxytocin, mostly because of its longer half-life.[4]

The possibility of reducing the requirement for rescue uterotonics is another advantage. However, there is little information currently available on the precise impact of carbetocin on maternal hemodynamics.4 Therefore, the goal of this study was to compare the hemodynamic effects of oxytocin and carbetocin in patients undergoing elective cesarean sections or LSCS under spinal anesthesia.

MATERIALS AND METHODS

The goal of the current observational analytical study was to compare the hemodynamic effects of carbetocin and oxytocin in patients undergoing elective cesarean sections or LSCS under spinal anesthesia. The Institute's Department of Anesthesia provided the study participants. Prior to their involvement in the study, all participants provided written and verbal informed consent.

The current study evaluated 140 female participants, ages 18 to 35, who were in ASA physical status II, had term singleton pregnancies, and were undergoing elective caesarean sections at the Institute under spinal anesthesia during the specified study period. The study's exclusion criteria included refusal to participate, ASA status III or IV, obstetric complications such as multiple gestations, spinal anomalies, placental abruption, and/or placenta previa, pre-existing systemic diseases such as cardiovascular disease or thyroid disorders, pregnancy-related complications such as gestational diabetes or pre-eclampsia, and contraindication for spinal anesthesia.

Following their arrival at the preoperative site, participants were split into two groups at random, with Group I receiving a single intravenous dose of carbetocin and Group II receiving oxytocin. An 18-gauge cannula was fastened in the operation room. After the monitors were attached, hemodynamic parameters such as blood pressure, ECG, and pulse oximetry were measured. Ringer's lactate solution (15 ml/kg) was used to preload each individual. After the individuals were seated, a 25G needle was used to provide spinal anesthetic at the L4-L5 or L3-L4 level using 0.5% of 2ml hyperbaric bupivacaine and 25 µg fentanyl.

Subjects in Group I (carbetocin) received an intravenous bolus of 100 µg diluted in 9 ml normal saline to a total volume of 10 ml over the course of one minute. This was followed by a placebo-equivalent infusion of 2 ml of Ringer's lactate in 500 ml at a rate of 100 ml/hr. Subjects in Group II (oxytocin) received a continuous infusion of 10 IU oxytocin in 500 ml of Ringer's lactate at a rate of 100 ml/hr after receiving a 5 IU intravenous bolus diluted in 9 ml of normal saline to a total volume of 10 ml over the course of one minute.

Mean arterial pressure (MAP), diastolic blood pressure (DBP), systolic blood pressure (SBP), and heart rate (HR) were measured prior to medication delivery (baseline), one, two, and five min after drug administration, and then every five min until operation was finished. The surgeon will manually palpate the uterus at 2, 5, and 10 min after the study medication is administered. The surgeons' recommendations regarding the need for further uterotonic medication were evaluated. Additionally evaluated were intraoperative adverse effects such as headache, vomiting, and flushing. A 6 mg IV bolus of mephentermine was used to treat hypotension, which was defined as a 20% drop in systolic blood pressure from baseline. The total required dose was also determined.

The collected data was statistically examined using the chi-square test, Fisher's exact test, Mann Whitney U test, and ANOVA, chi-square test, and student's t-test in SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA). A p-value of less than 0.05 was used as the significance criterion.

RESULTS

The goal of the current observational analytical study was to compare the hemodynamic effects of carbetocin and oxytocin in patients undergoing elective cesarean sections or LSCS under spinal anesthesia. In the current study, 140 participants undergoing elective caesarean sections at the Institute under spinal anesthesia during the specified study period were evaluated. They were randomly assigned to two groups, Group I receiving a single intravenous dose of carbetocin and

Group II receiving oxytocin. When comparing the diastolic blood pressure of the two study subject groups, there was no discernible difference at any of the assessment time intervals, with the exception of 10 min following surgery, when Group I's diastolic blood pressure was significantly higher than Group II's (p=0.03) (Table 1).

With p-values of 0.717, 0.263, 0.327, 0.832, 0.272, 0.421, 0.104, 0.321, 0.607, 0.641, and 0.849, it was observed that mean arterial pressure in Groups I and II at baseline, immediately before drug, 1 minute after completion, 5 min after completion, 15 min after completion, 20 min after completion, 25 min after completion, 20 min after completion, 25 min after completion, 25 min after completion, 25 min after completion, 20 min after completion, 25 min after completion, 25 min after completion, 35 min after completion, 321, and 60. However, the mean arterial pressure was considerably greater with carbetocin than with oxytocin ten min after completion (p=0.04) (Table 2).

According to the study's findings, additional uterotonics were required in 5.7% (n=4) of Group I's subjects and 31% (n=22) of Group I's subjects for both intraoperative and postoperative assessments. This was significantly higher in Group II subjects than in Group I subjects (p=0.01). Additional uterotonics were required for postoperative evaluation in 5.7% (n=4) of Group II individuals and none of the study subjects, indicating a non-significant difference with p=0.471 (Table 3).

When the adverse effects of the two groups of study participants were evaluated, 8.6% (n=6) of the subjects in the oxytocin group and none of the people on carbetocin reported experiencing headaches. With a p-value of 0.237, the difference was not statistically significant. Nausea was reported in 8.6% (n=6) of Group I individuals and none of Group II subjects, indicating a statistically non-significant difference with p=0.237 (Table 4).

DISCUSSION

In the current study, 140 participants undergoing elective caesarean sections at the Institute under spinal anesthesia during the specified study period were evaluated. They were randomly assigned to two groups, Group I receiving a single intravenous dose of carbetocin and Group II receiving oxytocin. With the exception of 10 min following surgery, when diastolic blood pressure was considerably higher in Group I compared to Group II (p=0.03), there was no discernible difference in the two groups of research patients' diastolic blood pressure at any of the evaluation time intervals.

These results were consistent with those of Pattanaik S et al. (2026) and Amornpetchakul P et al. (2018), whose authors similarly found mean diastolic pressure results similar to the current study.

With p-values of 0.717, 0.263, 0.327, 0.832, 0.272, 0.421, 0.104, 0.321, 0.607, 0.641, and 0.849, the study's findings revealed a statistically non-significant difference in mean arterial pressure between Groups I and II at baseline, 5 min after completion, 15 min after completion, 20 min after completion, 25 min after completion, 25 min after completion, 25 min after completion, 25 min after completion, 20 min after completion, 25 min after completion, 25 min after completion, 25 min after completion, 321, 55 min after completion, 0.832, 0.

However, the mean arterial pressure was considerably greater with carbetocin than with oxytocin at 10 min after completion (p=0.04). These findings were in line with those of Jin B et al. (2016) and Tse KY et al. (2020), whose mean arterial pressure values were similar to those of the current investigation.

Additional uterotonics were found to be required in 5.7% (n=4) of Group I subjects and 31% (n=22) of Group I subjects on intraoperative assessment. This was significantly higher in Group II subjects compared to Group I subjects (p=0.01). Additional uterotonics were required for postoperative assessment in both the study subject and 5.7% (n=4) subjects from Group II, showing a non-significant difference with p=0.471.

These results were consistent with those of Hollebam CAG et al. (2018) and Voon HY et al. (2013), who also reported similar requirements for extra uterotonics. Regarding the evaluation of the adverse effects observed in the two study groups, headache was reported by 8.6% (n=6) of the subjects in the oxytocin group and by none of the patients on carbetocin. With a p-value of 0.237, the difference was not statistically significant. Nausea was reported in 8.6% (n=6) of Group I patients and none of Group II respondents, indicating a statistically non-significant difference with p=0.237.

These findings were consistent with those of Su LL et al. (2007) and Reyes OA et al. (2011), whose side-effects were similar to those of the current investigation.

CONCLUSION

The current study shows, within its constraints, that carbetocin exhibits better hemodynamic stability than oxytocin while maintaining a similar safety profile and uterotonic effectiveness. Carbetocin considerably reduced the need for rescue uterotonics, which supports its usage as the recommended preventive medication in patients undergoing spinal anesthesia for cesarean sections.

REFERENCES

1. Dyer RA, Butwick AJ, Carvalho B. Oxytocin for labour and caesarean delivery: implications for the anaesthesiologist. Curr Opin Anaesthesiol. 2011;24:255–61.
2. Pattanaik S, Rai A, Batool S, Dolma L, Bhutia MP, Yougyal T. Comparative study of hemodynamic effects of carbetocin and oxytocin in patient undergoing elective lower segment caesarean section under spinal anaesthesia: An observational analytical study. Indian J Clin Anaesth. 2020;13:90–96.
3. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2021.
4. Mahdzir DF. Haemodynamic effects of oxytocin versus carbetocin given as intravenous bolus to parturient undergoing caesarean delivery under spinal anaesthesia [dissertation]. Malaysia: Universiti Sains Malaysia; 2014.
5. Esseissah SA, Mohamed HI, Elnoury MA, Ali AN. Efficacy of Carbetocin versus Oxytocin and Ergometrin in Prevention of Postpartum Hemorrhage after Cesarean Section. Benha J Appl Sci. 2021;7:109–15.
6. Amornpetchakul P, Lertbunnaphong T, Boriboonhiransarn D, Leetheeragul J, Sirisomboon R, Jiraprasertwong R. Intravenous carbetocin versus intravenous oxytocin for preventing atonic postpartum hemorrhage after normal vaginal delivery in high-risk singleton pregnancies: a triple-blind randomized controlled trial. Arch Gynecol Obstet. 2018;298:319–27.
7. Jin B, Du Y, Zhang F, Zhang K, Wang L, Cui L. Carbetocin for the prevention of postpartum hemorrhage: a systematic review and meta-analysis of randomized controlled trials. J Matern Fetal Neonatal Med. 2016;29:400–7.
8. Tse KY, Yu FNY, Leung KY. Comparison of carbetocin and oxytocin infusions in reducing the requirement for additional uterotonics or procedures in women at increased risk of postpartum haemorrhage after Caesarean section. Hong Kong Med J. 2020;26:382–89.
9. Holleboom CAG, van Eyck J, Koenen SV, Kreuwel IAM, Bergwerff F, Creutzberg EC, et al. Carbetocin in comparison with oxytocin in several dosing regimens for the prevention of uterine atony after elective caesarean section in the Netherlands. Arch Gynecol Obstet. 2013;287:1111–7.
10. Voon HY, Suharjono HN, Shafie AA, Bujang MA. Carbetocin versus oxytocin for the prevention of postpartum hemorrhage: A meta-analysis of randomized controlled trials in cesarean deliveries. Taiwan J Obstet Gynecol. 2018;57:332–9.
11. Su LL, Chong YS, Samuel M. Oxytocin agonists for preventing postpartum haemorrhage. Cochrane Database Syst Rev. 2007;18:CD005457.
12. Reyes OA, Gonzalez GM. Carbetocin versus oxytocin for prevention of postpartum hemorrhage in patients with severe preeclampsia: a double-blind randomized controlled trial. J Obstet Gynaecol Can. 2011;33:1099–104.

S. No	Diastolic BP	Group II (n)	Group II (mean)	Group I (n)	Group I (mean)	p-value
1.	**Baseline**	70	76.3±8.4	70	78.9±12.6	0.324
2.	**Immediately before drug**	70	69.8±10.2	70	71±9.5	0.614
3.	**1 min after completion**	70	63.1±11.4	70	60.3±9.4	0.273
4.	**2 min after completion**	70	65.3±7.6	70	65.8±9.6	0.787
5.	**5 min after completion**	70	63.3±8.3	70	65.1±9.4	0.317
6.	**10 min after completion**	70	59.3±8.8	70	63.7±8.9	**0.03**
7.	**15 min after completion**	70	59.3±10.1	66	60.4±9.5	0.537
8.	**20 min after completion**	66	58.3±10.5	60	62.8±8.9	0.09
9.	**25 min after completion**	60	62.0±10.3	44	64.3±9.0	0.415
10.	**30 min after completion**	56	64.2±9.6	36	65.7±7.5	0.575
11.	**35 min after completion**	44	67.6±8.8	28	67.3±9.5	0.919
12.	**40 min after completion**	30	71.9±9.7	20	70.1±6.3	0.614
13.	**45 min after completion**	22	69.1±3.6	12	75.1±9.6	0.09
14.	**50 min after completion**	16	70.2±5.1	6	74.1±5.5	0.307
15.	**55 min after completion**	10	73.8±6.3	2	66.8	0.361
16.	**60 min after completion**	10	74.4±9.5	0	-	-

Table 1: Comparison of diastolic blood pressure in the two groups of study subjects

S. No	Mean arterial pressure	Group II (n)	Group II (mean)	Group I (n)	Group I (mean)	p-value
1.	**Baseline**	70	91.5±10.2	70	90.6±11.5	0.717
2.	**Immediately before drug**	70	82.4±11.4	70	84.9±8.4	0.263
3.	**1 min after completion**	70	77.3±11.8	70	74.8±10.0	0.327
4.	**2 min after completion**	70	79.6±8.1	70	80.0±9.5	0.832
5.	**5 min after completion**	70	77.0±8.3	70	79.2±8.7	0.272
6.	**10 min after completion**	70	73.1±8.6	70	77.4±8.7	**0.04**
7.	**15 min after completion**	70	73.7±9.9	66	75.5±9.3	0.421
8.	**20 min after completion**	66	73.2±9.7	60	77.3±9.2	0.104
9.	**25 min after completion**	60	76.3±10.3	44	79.0±9.3	0.321
10.	**30 min after completion**	56	77.8±8.7	36	79.2±8.1	0.607
11.	**35 min after completion**	44	81.1±8.8	28	79.7±10.5	0.641
12.	**40 min after completion**	30	84.3±8.0	20	84.9±7.9	0.849
13.	**45 min after completion**	22	82.4±4.2	12	87.0±10.9	0.221
14.	**50 min after completion**	16	85.1±6.1	6	88.1±6.3	0.488
15.	**55 min after completion**	10	88.8±7.5	2	81.2	0.374
16.	**60 min after completion**	10	89.0±11.0	0	-	-

Table 2: Comparison of mean arterial pressure in the two groups of study subjects

S. No	Additional uterotonics	Group I (n)	Group I (%)	Group II (n)	Group II (%)	p-value
1.	**Intraoperative**					
a)	Yes	4	5.7	22	31	**0.01**
b)	No	66	94	48	69	
2.	**Postoperative**					
a)	Yes	0	0	4	5.7	0.471
b)	No	70	100	66	94	

Table 3: Additional need of uterotonics in two groups of study subjects intraoperative and postoperatively

S. No	Side effects	Group I (n)	Group I (%)	Group II (n)	Group II (%)	p-value
1.	**Headache**	0	0	6	8.6	0.237
2.	**Nausea**	6	8.6	0	0	0.237

Table 4: Side-effects seen in two groups of study subjects