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COMPARISON OF TWO INFUSION DOSES OF OXYTOCIN IN PARTURIENTS UNDERGOING ELECTIVE CAESAREAN SECTION

Anesthesiology

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ABSTRACT

Introduction Oxytocin is routinely administered as an intravenous (IV) bolus followed by infusion for adequate uterine contraction.[1] We aimed to compare two different infusion doses of oxytocin (3 IU vs 2 IU over 5 min) followed by maintenance infusion in terms of hemodynamic effects, uterine contraction and adverse effects.

Material & Methods Fifty patients in age group of 20-35 years, undergoing elective caesarean section under spinal anaesthesia (SA) were enrolled. The patients were randomly allocated to receive 3 International units (IU) of oxytocin (Group I) or 2 IU of oxytocin (group II) as an infusion over 5 minutes. HR and MAP were measured at 2 minute interval up to 10 minutes after SA, at time of delivery and at 2 minute interval up to 10 minutes after oxytocin administration and 5 min interval up to 30 min.. After 3 minutes, obstetricians were asked about adequacy of uterine contraction and noted as either "adequate" or "inadequate. If uterus was not adequately contracted after 5 minutes, oxytocin 2.5 IU IV was given as rescue dose. A maximum of 2 rescue doses were given. If still the uterus was not contracted, misoprostol 800 mcg suppository was given.

Results Two patients developed hypotension after SA and required ephedrine before delivery. Changes in HR and MBP were not significant between the groups. Group II (2 U over 5 min) patients needed more number of rescue doses of oxytocin than group I, while only one patient in each group needed rescue uterotonic other than oxytocin.

Conclusion Infusion of 3 IU over 5 minutes is better than 2 IU as less rescue bolus of oxytocin is required with its use.

KEYWORDS

Oxytocin, infusion, caesarean section

Introduction

Oxytocin is the most commonly used uterotonic agent in obstetrics. It is routinely administered for the induction, augmentation of labor and prevention and treatment of postpartum hemorrhage after both normal and operative delivery.[1] Oxytocin is commonly administered as an intravenous (IV) bolus followed by IV infusion for adequate uterine contraction. Several regimens of oxytocin have been tested during caesarean delivery (CD) with variable wanted (uterotonic) and unwanted (cardiovascular) effects.[2-5] Rapid bolus of oxytocin injected IV is known to produce various adverse effects such as hypotension, nausea, vomiting, chest pain, headache, flushing, myocardial ischemia, STT segment changes, pulmonary edema, severe water intoxication, and convulsions.[6] Slower injection of oxytocin can effectively minimize cardiovascular side effects of a bolus dose without compromising therapeutic benefits.

We aimed to compare two different infusion doses of oxytocin (3U vs 2 U over 5 min) followed by maintenance infusion in terms of hemodynamic effects, uterine contraction and adverse effects.

Material and Methods

The study was approved from institutional ethical committee and informed consent from all the participants was obtained. Total of 50 patients in age group of 20-35 years, belonging to American Society of Anesthesiologists (ASA) physical status II / III and scheduled to undergo elective caesarean section under spinal anaesthesia were enrolled in the present study.

The study was carried out prospectively in a double-blinded randomized manner. All patients were examined and thoroughly investigated preoperatively. All patients were kept fasting for 6 hours and prescribed routine premedication. In the operating room, two IV lines were secured using 18G & 20 G cannula. Preloading was done with 10 ml/kg Ringer's lactate solution over 30 minutes before SA, followed by infusion of 5 ml/kg/hour. Baseline mean arterial pressure (MAP) and heart rate (HR) were recorded. The patients were randomly allocated to receive 3 IU of oxytocin (Group I) or 2 IU of oxytocin (group II) as an infusion over 5 minutes (group II). Allocation to one of two groups was done using sealed coded envelopes.

Patients concerned as well as data collector were blind to the mode of administration of oxytocin Under aseptic precautions, 10 mg hyperbaric bupivacaine (0.5%) with 25 µg fentanyl was administered in L3-L4 intervertebral space with the patients in the sitting position using a 25G spinal needle. Patients were then made supine with left lateral uterine displacement using a wedge. Surgery was allowed to proceed after achieving a T4 level to touch to cotton ball soaked in alcohol. Oxytocin was administered as per the group allocated after delivery of the baby. Patients having a fall in MAP (< 65mm Hg) before the administration of oxytocin were treated with IV bolus of 5 mg of ephedrine and were excluded from the study. HR and MAP were measured at 2 minute interval up to 10 minutes after SA then at time of delivery. HR and MAP were recorded again at 2 minute interval up to 10 minutes after oxytocin administration and then at 5 min interval up to 30 min. Obstetricians were asked about the adequacy of uterine contraction 3 minutes after start of injection oxytocin and noted as either "adequate" or "inadequate. Any adverse events like ECG changes, chest pain, flushing, and vomiting were also observed. If uterus was not adequately contracted after 5 minutes, oxytocin 2.5 IU IV was given as rescue dose. A maximum of 2 rescue doses were given. If still the uterus was not contracted, misoprostol 800 mcg suppository was given. After the study period patients received a maintenance IV infusion of oxytocin as per department protocol.

Patient characteristics, obstetric and intraoperative data were presented as mean ± SD. Numerical data were analyzed with paired and independent *t* test and categorical data were analyzed with Chi square test. A *P* value of <0.05 was considered to be statistically significant.

Results

Out of fifty patients enrolled 2 patients developed hypotension after SA and required ephedrine before delivery. The groups were comparable demographically in respect of age, sex, weight and duration of surgery.

HR increased by 2-5 beats per minute in both groups after oxytocin administration as compared to HR at time of delivery. MBP decreased by 3-10 mm Hg in group I and did not return to baseline up to 30 minutes. In group II, MBP was almost close to baseline till 15 min after oxytocin administration. After 15 minutes, it decreased by 2-7 mm Hg and returned to baseline at 25 min (Graph 1). Changes in HR and MBP were not significant when compared between the groups. Adequacy of uterine tone is given in table 1. After 3 minutes uterine tone was adequate in 21 & 13 patients and inadequate in 3 & 11 patients in group I & II respectively. Two patients in group I (5IU, 2.5 IU) and 6 patients (4 patients – 5 IU, 2 patients- 2.5 IU) in group II required rescue bolus of oxytocin. One patient in each group required misoprostol 800 µg per rectally. Three patients in group I and one in group II complained of nausea and retching.

Graph 1. Comparison of HR and MBP between two groups after oxytocin administration.

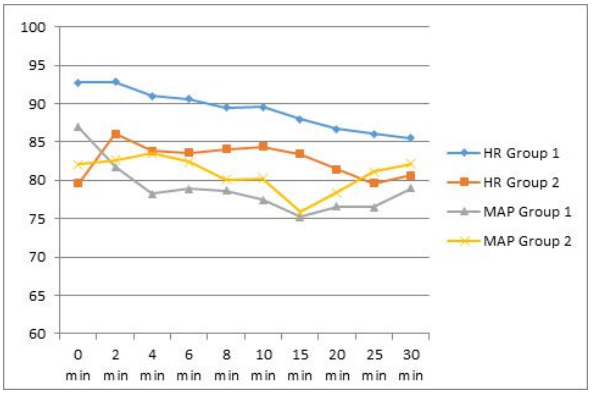

Table 1. Comparison of adequacy of uterine tone between two groups

	Group 1		Group 2		
	Adequate (A)	Inadequate (IA)	Adequate (A)	Inadequate (IA)	P value
3 min	21	3	13	11	.019*
6 min	22	2	22	2	.549
9 min	24	0	21	3	.072

P value < .05 is significant and is marked with *.

Discussion

Oxytocin is the first line agent in prevention and treatment of PPH in patients undergoing caesarean section. Prophylactic routine use of oxytocin has been shown to reduce incidence of PPH by up to 40% [7]. Despite widespread use, literature is inconclusive regarding its most appropriate dose in patients undergoing elective CD.

Uterine oxytocin receptors population increases progressively during pregnancy and reaches peak at term. In late pregnancy, oxytocin receptors are on average 12 times higher than in early pregnancy and about 80 times higher than in non-pregnant uterus. As the non-laboring uterus at term remains more sensitive to oxytocin, low dose of oxytocin might have an optimum efficacy avoiding the deleterious effects of high dose[6] We selected mothers undergoing elective CD not in labor expecting a good response with low dose of oxytocin.

During onset of labor, sensitivity to oxytocin increases and oxytocin receptors express diffusely and heterogeneously.[6] It is a usual practice to increase the dose of oxytocin, assuming that higher doses will result in more effective uterine contraction. Higher doses of oxytocin are unlikely to improve uterine contractions further during CD in laboring mothers who were already receiving oxytocin. *P*rior exposure to oxytocin induces myometrial oxytocin receptor desensitization[1] Oxytocin induced desensitization is dependent upon duration of exposure and occurs over a clinically relevant time frame of approximately 4.2 hours.[8] This can influence the optimum oxytocin dosing for adequate uterine tone following caesarean delivery in mothers who are already receiving oxytocin. The dose of oxytocin required is nine times higher in laboring women than non-laboring women.[9] It is suggested that excessive doses of oxytocin to achieve adequate uterine tone during elective CD needs reevaluation.[4] It is observed that adequate uterine tone can be achieved with small bolus doses like 0.53 IU of oxytocin but the incidence of hypotension increases significantly after 5 IU.[3] We used oxytocin either as 3 IU or 2 IU infusion over 5 minutes. In this study, group II (2 IU over 5 min) patients needed more number of rescue doses of oxytocin than group I, while only one patient in each group needed rescue uterotonic other than oxytocin.(Misoprostol PR). Rest of the patients in both groups had adequate amount of uterine contraction. Changes in HR and MBP were comparable in both the groups. Rapidly injected large doses of oxytocin are known to produce various adverse effects such as hypotension, nausea, vomiting, chest pain, headache, flushing, myocardial ischemia, STT segment changes, pulmonary edema, and severe water intoxication with convulsions.[6] ED_{90} of oxytocin reported to prevent uterine atony and PPH after an elective CD is 0.29 IU/minute and is much lower than dose in use.

Conclusion

We conclude that, iv infusion of oxytocin is better as it produces adequate uterine contraction and less side effects. Infusion of 3 IU over 5 minutes is better than 2 IU as less rescue bolus of oxytocin is required with its use.

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