Original Article

Effect of oxytocin on haemodynamic change during caesarean section under spinal anaesthesia - A comparison between intravenous bolus or infusion technique

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Abstract

Background *Subarachnoid block for caesarean section is very acceptable technique and it rates are steadily increasing in recent years. It is now spreading up to remote areas. Infusion technique of oxytocin is safe during caesarean section under spinal anaesthesia.*

Objective *To compare the haemodynamic changes caused by oxytocin given as an I/V bolus or infusion to decrease uterine bleeding in caesarean section.*

Method *A total number of sixty patients ASA grade I were selected. Thirty patient in each group. In group A, parturient received oxytocin 5IU of I/V in bolus and group B, infusion of oxytocin 5IU diluted with 5ml normal saline given I/V over 2 min by using infusion pump. The study period was started just before oxytocin given and it was continued for a further 10 min. Systolic and diastolic BP, MAP, heart rate, uterine bleeding were recorded in every 1 min.*

Result *The mean difference of all haemodynamic parameters at 2 to 5 mins of administration of oxytocin were statistically significant (p <0.05).*

Conclusion *The haemodynamic changes were more marked in I/V bolus of oxytocin than infusion technique.*

Key words: *Oxytocin, bolus, infusion, haemodynamic, intravenous.*

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Introduction

Caesarean section is a very common surgical procedure for delivery of baby and it rates are steadily increasing in recent years and regional anesthesia has become the preferred technique[1]. Maternal hypotension is a recognized complication of subarachnoid block which may compromise the welfare of both mother and fetus and some times it may lead to a dangerous complication, cardiac arrest leading to remarkable number of mortality and morbidity[3].

Oxitocin, ergot derivatives and prostaglandins are extensively used in clinical practice[4]. The doses schedule of oxytocin drugs in induction and augmentation should aim to initiate effective contraction leading to decreased blood loss, good uterine contraction and good obstetric outcome[5].After caesarean section uterus relaxes. We use some technique to contract uterus. Manual stimulation sometimes causes uterus contraction. Usually we use some drugs e.g. ergometrine and oxytocin etc. to contract uterus. Ergometrine causes nausea, vomiting, vesoconstriction as a result increased blood pressure and CVP[6].

Oxytocin is an octapeptide hormone secreted mainly from posterior pituitary gland , is a potent

stimulant that is essential after caesarean section[7]. Oxytocin causes uterine contraction as well as decrease bleeding after caesarean section but it cause hypotension and tachycardia[8].

In this study, we tried to find out the effect (haemodynamic change at heart rate, blood pressure and uterine contraction) of the recommended dose (ie 5IU) of Oxytocin when given as IV bolus or slow IV infusion diluted in 5 ml of distilled water over 2 minutes during caesarean section under spinal anesthesia.

Methods

A total number of sixty patients undergoing elective caesarean section ASA grade-I were selected randomly as per inclusion and exclusion criteria in two groups. In group A, parturient received 5IU oxytocin IV bolus and group B received slow infusion of oxytocin diluted with 5ml normal saline over 2 minutes by using infusion pump.

Each parturient pre medicated with cap. omeprazole 20mg orally. 1 cap. at evening before and 1 cap. at morning of operation. Arterial blood pressure and heart rate,Spo_2 were recorded . A 18G IV cannula will be inserted and ringer's lactate solution preloaded 10 ml per kg body weight and IV drip was given same as body weight during caesarean section.

With all aseptic precaution spinal anesthesia was given at L3/4 space in sitting position and 2.0 ml. 0.5% Bupivacaine heavy was given intrathecally. Then patient was kept in supine position with left sided with wedge in right buttock and oxygen was given intraoperatively with nasal cannula. After testing the height and quality of the block urinary catheterization was done and surgeon allowed starting the operation. After delivery of the fetus group A received 5IU oxytocin (inj. Piton-S) bolus (Approximately over 1 sec) and group B received 5IU oxytocin (inj. Piton-S) IV infusion slowly diluted with 5 ml normal saline over 2 min. Baseline data was taken before oxytocin given.

Patient was monitored every 3min interval up to the delivery of the fetus. After delivery of the fetus patient was monitored systolic and diastolic BP, MAP, heart rate, oxygen saturation, uterine contraction, uterine bleeding and any adverse effect was recorded in every 1min in data sheet. The study period was started just before oxytocin given and it was continued for a further 10 min. The study period of 10 min was set after a small pilot study. Patient was observed by surgeon the state of uterine contraction expressed as mild, moderate or fully contracted. Uterine bleeding was calculated after suctioning amniotic fluid and blood in separate bottle and visually estimating the blood by surgical sponger and laparotomy pads (laps). A fully soaked sponge (4x4) each side to hold 10 ml of blood, where as a soaked MOP holds 100-150ml. Quantitative definition of postpartum hemorrhage was arbitrary and related to the amount of blood loss in excess of 500 ml following birth of the baby.

At the end of surgery 200 microgram misoprostal per-rectally was given of each patient. Postoperatively patient was monitored the state of uterine contraction, P/v bleeding and cardiovascular status.

All the relevant information for each of the study was recorded on predigined data sheet with the help of volunteers as per requirements.

The result complied and analyzed statistically by unpaired-t test with a p value <0.05 with 95% confident limit.

Results

Observation of the present study was analyzed in the light of comparison among the subject groups, each group having n=30.All results are expressed as mean ± standard deviation. The studied groups became statistically matched for age, gestational age, weight heart rate, systolic and diastolic blood pressure, mean arterial pressure.

Table I : *Demographic data*

Group	Age(yrs) Mean±SD	Gestational age(weeks) Mean±SD	Weitht(Kg) Mean±SD
A	24.1±6.0	39.4±0.7	59.3±3.0
B	25.1±4.7	39.6±0.8	59.9±2.3
P	0.489	0.360	0.327

Values were expressed as mean±SD. Analysis was done by unpaired t-test. There was no significant difference between the groups.

Table II *Changes of heart rate*

	Pre operative	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
A	85.7±3.9	92.3±10	98±2.8	101±5.1	102±7.5	105±5.2	93.2±2.3	92.5±3.0	94.4±12	95.4±10	94±11
B	87.7±5.2	91.3±11	92.6±2.2	90±4.4	87±6.6	90±2.1	90.4±3.5	89.3±2.6	93.7±8.2	95.5±12	95±11
p	0.10	0.72	0.00	0.02	0.01	0.02	0.46	0.38	0.82	0.95	0.95

Values were expressed as mean±SD. Analysis was done by unpaired t-test. The above table shows the heart rate of preoperative and just after giving oxytocin up to 10 minutes one minute interval. There were significant difference between the groups from 2min to 5min. ($p<0.05$).

Table III : *Changes of systolic blood pressure*

	Pre operative	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
A	117±7.8	116±7.5	100±7.3	95.5±5.4	96.5±4.5	97.3±4.5	100±8.1	104±11	104±10	105±10	103±11
B	120±6.9	119±6.7	108±6.9	108±4.3	107±3.6	106±3.6	105±7.4	108±11	108±12	107±11	107±10
p	0.16	0.10	0.02	0.00	0.02	0.03	0.16	0.12	0.24	0.40	0.40

Values were expressed as mean±SD. Analysis was done by unpaired t-test. The above table shows the systolic blood pressure of preoperative and just after giving oxytocin up to 10 minutes one minute interval. There were significant difference between the groups from 2min to 5min.($p<0.05$).

Table IV : *Changes of diastolic blood pressure*

	Pre operative	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
A	76.3±5.6	72.8±8.5	50.5±3.8	60±9.9	60.8±3.6	61.3±3.6	70.1±4.3	65.3±9.1	68.3±8.1	67±8.7	67.7±8.5
B	78.7±4.3	73.5±8.9	55.0±3.6	73.7±8.1	73.3±4.9	72.6±4.8	74.9±4.9	67.5±8.4	69.7±7.9	69±9.6	69.7±S10
P	0.07	0.71	0.03	0.02	0.01	0.03	0.31	0.42	0.52	0.88	0.88

Values were expressed as mean±SD. Analysis was done by unpaired t-test. The above table shows the Diastolic blood pressure of preoperative and just after giving oxytocin up to 10 minutes one minute interval. There were significant difference between the groups from 2min to 5min.($p<0.05$).

Table V : *Changes of mean arterial pressure*

	Pre operative	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
A	90±6	86.4±5.8	64.3±5.4	64.2±6.2	65.3±5.8	64.7±4.2	69.9±5.3	67.9±5.3	68.5±8.3	69±6.9	64.6±6
B	92.4±3.9	86.3±6.2	72±6	74.7±7.3	73.4±6.2	74.3±5.3	74.8±6.4	70.8±6.4	71.6±9.1	72.1±7.7	72.1±4.7
p	0.06	0.94	0.00	0.03	0.03	0.01	0.35	0.25	0.36	0.24	0.16

Values were expressed as mean±SD. Analysis was done by unpaired t-test. The above table shows the mean arterial pressure of preoperative and just after giving oxytocin upto 10 minutes observed one minute interval. There were significant difference between the groups from 2min to 5min $p<0.05$.

Table VI : *Distribution of PPH in both groups*

Complications	Group A		Group B	
	n	%	n	%
Ignored bleeding< 500ml	30	100	30	100
Postpartum haemorrhage	0	0.0	0	0.0

The above table shows the PPH of patients and found all patients ignored bleeding <500ml in both groups.

Discussion

This prospective, interventional study was carried with an objective to compare the haemodynamic changes caused by oxytocin given as an I/V bolus or infusion to decrease uterine bleeding in caesarean section under spinal anaesthesia. A total of 60 pregnant women age between 18 to 36 years weight between 55 kg to 65 kg belonging physical status ASA grade I with term pregnancy (37 weeks and above) undergo elective caesarean section under spinal anaesthesia were enrolled in this study. These patients were divided into two groups of thirty patients each formed by randomly selected patients by blind envelope method. Out of which 30 were included in group A received 5IU oxytocin bolus (approximately over 1 sec) and 30 in group B, received 5IU oxytocin IV infusion diluted with 5ml normal saline over 2 minutes.

This study shows that slower infusion of 5IU oxytocin can effectively minimize the cardiovascular side-effects but rapid bolus oxytocin causes marked cardiovascular instability without compromising the therapeutic benefits.

The current study demonstrated an average decrease in MAP of 24 mmHg range from 19 to 32 mmHg in group A during 2 to 5 minutes in healthy women having an elective caesarean section who received 5IU of oxytocin as a rapid bolus. Whereas in group B average decrease in MAP of 12 mmHg range from 8 to 18 mmHg during 2 to 5 minutes. Whilst this magnitude of decrease in MAP may be well tolerated normally.

In the present study it was observed that the changes in heart rate were significantly higher in group A with compared to group B during 2 to 5 minutes. However, the gentler increase of heart rate in the infusion group (group B) is preferable clinically. It is reassuring to the anaesthetiologist who prefers to maintain cardiovascular status that this physiological insult can be avoided simply by giving 5IU oxytocin infusion over 2 min. Thomas JS (2006) and his colleague found in their study that the decrease in MAP of 8(8.7) mmHg and the small increase in HR are certainly clinically preferable, which is closely resemble with the present study.[29]

Obviously there have been discussions within the obstetric anaesthesia community about the correct dose of oxytocin and its method of administration.[30] Despite the controversy it seems more anesthetiologist are using the lower dose of 5IU as recommended by the CEMD[31]. This is supported by the work of Pinder and colleagues[9] who showed dose-related haemodynamic effects, although they underestimated the potential reduction in MAP attributable to the usage of lower dosage by showing greater haemodynamic stability when 5IU is administered over 5 min.

Whilst the cardiovascular results of this study are unequivocal, it was acceptable that <500 ml bleeding during caesarean section was ignored in this study. Uterine contraction and urine output were in satisfactory level in both groups. Post partum haemorrhage was observed in the present study between two groups.

This study reports the need for caution using oxytocin as a bolus in cardiovascular unstable patients and offers relative reassurance of the effect when given as an infusion over 2 minutes. concluded that the haemodynamic changes were more marked in IV bolus group than IV slow infusion group. Slower injection of oxytocin can effectively minimize the cardiovascular side-effects as well as equally effective in reducing blood loss without compromising the therapeutic benefits.

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