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Comparison of 2 units and 5 units of Oxytocin bolus doses followed by infusion in patients undergoing elective Caesarean section

Shaila S. Kamath*[1], Amrut Rao K[2]

1. Associate Professor, 2. Senior Resident
Department of Anaesthesiology, Kasturba Medical College, Mangalore - 575001, India.

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***Corresponding author:**

Email : shailakamath@ymail.com
Tel.: +91-9844090231

ABSTRACT

This study was undertaken to compare the effects of 2 Units of oxytocin with that of 5 Units in elective caesarean section with respect to changes in heart rate, blood pressure and uterine tone. A total number of 80 patients were enrolled in this randomized double- blind study with 2 groups of 40 each. Immediately after delivery patients in Group I received 2 units Oxytocin intravenous bolus and patients in Group II received 5 units Oxytocin intravenous bolus. All received infusion of 20 units in 500ml Ringer's lactate at the rate of 10units/hour. Heart rate, mean arterial pressure, blood loss, uterine tone, emetic symptoms and need for additional uterotonic drugs were recorded. Statistical analysis was done using unpaired students t-test and chi square test. Decrease in blood pressure and increase in pulse rate was comparatively more in the 5 units group with maximum occurring between 6 to 10 minutes following bolus. Decrease in blood pressure and increase in pulse rate in 2 units group was lesser. The percentage of rescue drugs used for hypotension is significantly higher in 5 units group.
We conclude that in elective caesarean section after the extraction of the placenta, 2 units of bolus oxytocin is adequate for a good uterine contraction with no change in blood loss compared to 5 units.

INTRODUCTION

Neuraxial anaesthesia technique for caesarean section have several advantages, including a decreased risk of failed intubation and aspiration of gastric contents, avoidance of depressant agents, and the ability of the mother to remain awake and enjoy the birthing experience. In addition, it has been suggested that blood loss is reduced under regional anaesthesia for caesarean delivery.[1,2,3] Oxytocin is routinely administered during elective caesarean delivery to initiate and maintain adequate uterine contractility after placental delivery. The uterotonic effect of oxytocin is important in reducing blood loss from the site of placental attachment and decreasing the risk of postpartum haemorrhage. However, adverse haemodynamic effects are known to occur after intravenous oxytocin, notably tachycardia, hypotension.[4,5]Although many use 5 units oxytocin during elective caesarean delivery [4] there is limited evidence to substantiate this practice. Smaller bolus doses of oxytocin are associated with reduced frequency of adverse effects.[6,7] However, few studies have investigated the dose-related effects of an oxytocin bolus for achieving adequate uterine tone during elective caesarean delivery.[6,8,9] This study was undertaken to compare the effects of 2 Units of oxytocin regimen with that of 5 Units in elective caesarean section with respect to changes in heart rate, blood pressure and uterine tone. Also to look for blood loss and need for additional uterotonic drug requirements.

MATERIALS AND METHODS

This study was conducted at a teaching university hospital between July 2009 and July 2011. All ASA I and II pregnant women aged 18 years and above undergoing elective caesarean section were included in the study. Patients with risk of excessive bleeding or uterine atony, and cardiovascular instability including pre-eclampsia and essential hypertension were excluded from the study. Patients with history of more than 2 previous caesarean sections and post-partum haemorrhage were also excluded. Patients with mean arterial pressure less than 60mm of Hg just before oxytocin bolus were excluded from the study.

A total number of 80 patients were enrolled in this controlled randomized double- blind study with 2 groups of 40 each (Sample size was calculated after discussion with the statistician).

Institutional ethics committee approval was taken before the study and written informed consent was taken from patients undergoing elective caesarean section. Patients were allocated to one of the groups by randomization using a random number generator table. All the subjects received spinal anaesthesia 2cc of 0.5 % Bupivacaine heavy after local infiltration with 2ml of 2% Lignocaine at L3-L4 space. Preloading was done with ringers lactate solution at 15ml/kg before the procedure. A 15 cm wedge was kept under right gluteal region to avoid supine hypotension syndrome. None of the patients required additional general anaesthesia as the mean surgical time was 55 minutes. Immediately after delivery patients in Group I received 2 units Oxytocin intravenous bolus and patients in Group II received 5 units Oxytocin intravenous bolus. All the patients received infusion of 20 units in 500ml Ringer's lactate at the rate of 10units/hour. The parameters observed included heart rate; mean arterial pressure, blood loss, uterine tone, emetic symptoms and need for additional uterotonic drugs. The heart rate and mean arterial blood pressure was measured using multipara- Datex Ohmeda monitor.The last measurement of blood pressure and heart rate before giving Oxytocin was recorded as baseline for subsequent changes. The maximum heart rate after oxytocin bolus was recorded. Blood pressure was recorded every 2 minutes for the first 10 minutes (to avoid patient discomfort), every 5 minutes for next 10 minutes and then every 10 minutes till the end of surgery and the changes were recorded as continuous infusion of oxytocin 10 units per hour was used for the next two hours.

Blood Loss was determined by visual assessment of suction bottles and mops. Fresh mops were taken once the placenta was extracted. Mops soaked with amniotic fluid were discarded Uterine Tone was assessed by the Obstetrician, with an experience of 4 years or more, at 5, 10, 15 and 20 minutes after the delivery of the placenta on a 5-point scale as follows.[6]

1-Active tone

2- Partial but inadequate contraction

3-Adequate contraction

4-Well contracted

5- Very well contracted

Additional uterotonic drugs, if requested, were administered (Ergometrine 0.25mg intravenous or Oxytocin 5U, 10U) and recorded.

Blood pressure was maintained with ephedrine 5mg intravenous, if the mean arterial pressure was less than 60 mm Hg and further blood pressure was not recorded for that patient. Nausea and vomiting, if occurred, was dealt with rescue antiemetic, intravenous Metoclopramide 10mg or ondansetron 4mg or both and recorded. Statistical analysis was done using unpaired students t- test and chi square test. P value of < .05 was considered to be significant.

RESULTS

The average heights in cm in both groups were 155.17±5.7 and 153.27±5.41. With regard to the weight in kilograms the values were 65.9±7.75 and 64.97±5.87 (Table1).Blood pressure difference from the baseline blood pressures are compared between the two groups at 2, 4, 8, 10, 15, 20, 30, 40, 50, 60 and 70 mins.The decrease in blood pressure was comparatively more in the 5 units group with maximum occurring between 6 to 10 minutes following bolus. Decrease in blood pressure in 2 units group was lesser as seen in the Figure1and Table 2.

From 4 minutes, blood pressure was significantly reduced in group II when compared to group I and going to be very highly significant at 15, 20, 30 and 40 minutes. The increase in pulse rate

Table 1:

	Group I (2 units)	Group II(5 units)	p value
Height(cm)	155.17±5.7	153.27±5.41	0.359
Weight(kg)	65.9±7.75	64.97±5.87	0.653

Fig 1:

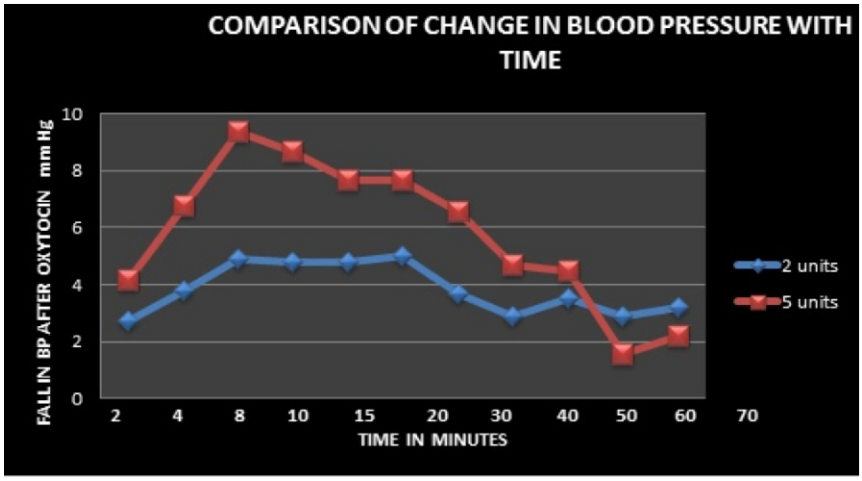


Table 2:

	Group	N	Mean	Std. Deviation	t	p
Base BP	Group I	40	77.5000	11.39951	1.80242	0.07 ns
	Group II	40	72.1750	7.91910	1.25212	0.21ns
BP 2	Group I	40	74.8000	10.09493	1.59615	0.11ns
	Group II	40	68.0488	12.82176	2.00242	0.05ns
BP 4	Group I	40	73.7250	11.19292	1.76976	0.08ns
	Group II	40	65.4500	13.12650	2.07548	0.04sig
BP 8	Group I	39	72.6923	9.14547	1.46445	0.15ns
	Group II	37	62.8378	12.64585	2.07896	0.04sig
BP10	Group I	39	72.7179	9.21083	1.47491	0.14ns
	Group II	24	63.5000	14.52434	2.96477	0.007hsig
BP15	Group I	38	72.7895	7.65527	1.24185	0.22ns
	Group II	18	64.5000	15.20546	3.58396	0.002vhs
BP20	Group I	38	72.5000	7.40982	1.20203	0.237ns
	Group II	14	64.5000	15.70767	4.19805	0.001vhs
BP30	Group I	38	73.8684	8.43792	1.36881	0.179ns
	Group II	13	65.6154	14.08036	3.90519	0.002vhs
BP40	Group I	37	74.6216	8.14232	1.33859	0.18ns
	Group II	11	67.5455	13.16331	3.96889	0.003vhs
BP50	Group I	28	74.0000	8.11948	1.53444	0.137ns
	Group II	7	67.7143	10.87373	4.10989	0.009hsig
BP60	Group I	16	74.6875	7.32774	1.83194	0.08ns
	Group II	3	70.6667	15.14376	8.74325	0.012sig
BP70	Group I	9	74.3333	7.68115	2.56038	0.05ns
	Group II	1	70.0000	.	.	

after 2 units of oxytocin and infusion was minimal. The increase in pulse rate after 5 units of oxytocin was significant. The comparison of mean increase in pulse rate among the groups (2 and 5 units oxytocin), with a $p<0.001$, was very highly significant (Figure 2).The uterine tone after oxytocin bolus of 2 and 5 units bolus followed by infusion does not show any significant difference at 5,10,15and 20 minutes, with both the groups attaining a well contracted state at approximately 20 minutes (Figure 3).The average blood loss calculated after the extraction of the placenta does not show any difference (Figure 4).The percentage of rescue drugs used for hypotension is significantly higher in 5 units group with a $p<0.001$ (Figure 5).

Fig 3:

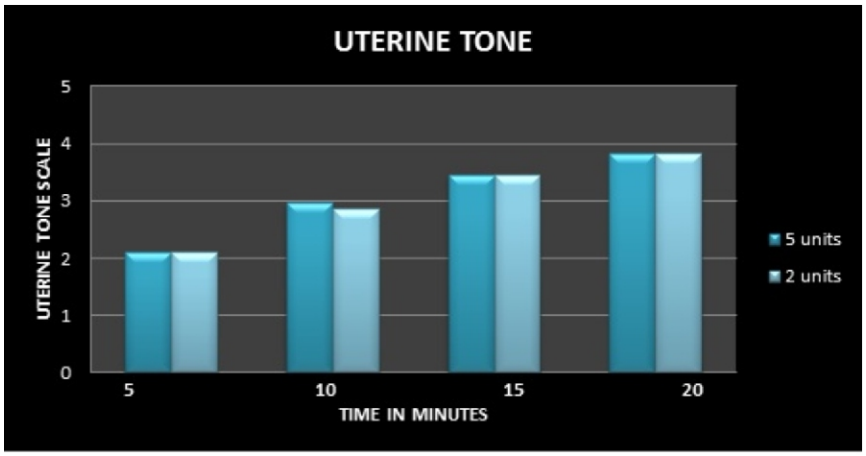


Fig 4:

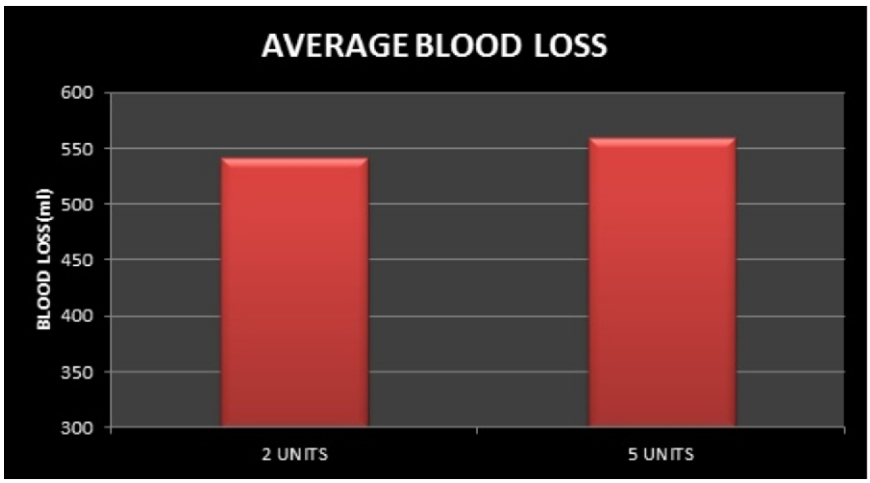
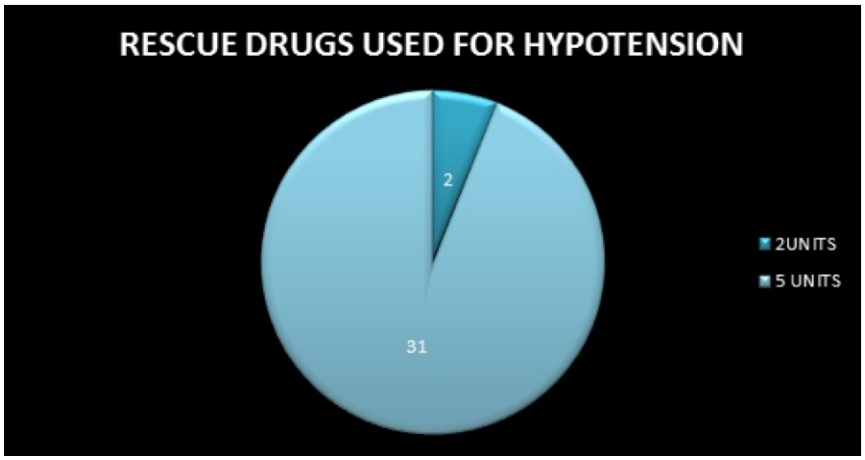


Fig 5:



DISCUSSION

The optimal dose of oxytocin is still under debate. The route, the amount and technique of oxytocin administration have been challenged by many anaesthesiologists worldwide. There have been studies which say lower bolus doses only of oxytocin is much superior, but there is a risk of inadequate contraction and bleeding.[10] Few studies have been conducted comparing bolus doses with only infusion of oxytocin with satisfactory results but challenging adequate uterine tone.[5] Hence, we thought of combining the two ways and study a lower dose of bolus oxytocin followed by a standard infusion of 10units/h for 2 hours. The results have been satisfactory and provide a scope for further practice. Every patient was preloaded with ringer's lactate 15ml/kg before subarachnoid blockade so as to avoid

hypotension. Patients with a mean arterial blood pressure of less than 60 mm of Hg just before giving oxytocin bolus were excluded from the study so as to keep a safety margin in the study. The findings in our study show that after the extraction of the placenta, a bolus of 2 units oxytocin followed with an infusion of 20units for 2 hours provides adequate uterine contraction.

In one study using invasive pressure monitoring, a decrease in MAP of 14 mm Hg was seen at 1 min after a 5units bolus, but with a maximum decrease of 27 mmHg at 25seconds. [5] In another study it was seen that there was an almost identical mean decrease of 13 mm Hg at 1 min after 5 units when measured by NIBP. [6] In our study a bolus dose of 5 units provided adequate uterine contraction but has side effects of hypotension with a maximum drop occurring between 4 to 10mins($p<0.001$, very highly significant drop) when compared to 2 units bolus. Blood pressure drop between 15- 50 mins has highly significant statistical result as shown in (Figure 1).

The rise in pulse rate from the baseline after 5 units of oxytocin is also higher with a mean rise of 8-10 when compared to a better stability in 2 units (Figure 2).

Although decreasing the oxytocin bolus minimizes haemodynamic changes. [4,5] Many doctors may be cautious about doing so because of concerns about poor uterine contraction and resultant increased bleeding. [7] The assessment of uterotonic efficacy at Caesarean section has been attempted by estimation of blood loss, the measurement of postoperative haemoglobin, assessment of uterine tone, and requests for supplementary uterotonic drugs.

A dose-finding study of 40 patients [9] estimated the ED90 of oxytocin at elective Caesarean section to be only 0.35 U, and found no need for further oxytocin with a maintenance infusion of 2.4 units/hr. Further research was needed to determine whether a smaller oxytocin bolus dose and a faster infusion rate would result in a more favourable balance of efficacy and side-effects. In our study we found no differences between the groups in blood loss, uterine tone, or the need for further uterotonics. In spite of a lower bolus dose of 2 units the uterine contraction was adequate with good contraction at the end of 20 minutes (Figure 3). Hence, none of the patients required any additional doses of uterotonic drugs. Blood loss on an average after the extraction of the placenta was around 550ml (Figure 4). The mops used prior to the extraction were changed and fresh mops were used every time after the placenta was extracted so that it would not be overestimated with amniotic fluid. Both groups showed minimal blood loss after the extraction. The overall blood loss on an average in caesarean section would be anywhere between 500 to 1200ml.The additional drugs used in the entire study included only ephedrine for hypotension with mean blood pressure less than 60 mm Hg. But the drug used in 5 units group was much higher and significant when compared to 2 units, showing that hypotension was more common in 5 units group. Patients receiving 2 units bolus of oxytocin with infusion were more haemodynamically stable. Moreover none of the patients required any antiemetic drugs as none of the 80 patients complained of nausea or vomiting.

The clinical importance of haemodynamic changes after oxytocin remains unclear. [4,12] Although maternal death has been attributed to the effects of a 10 units bolus of oxytocin, [13] catastrophic outcomes appear rare. The (usually transient) haemodynamic effects may only be important in the event of pre-existing heart disease or hypovolaemia, when patients may be unable to compensate for the sudden vasodilation. [10, 11] Even smaller initial bolus, or an oxytocin infusion alone, might be a safer option in these situations.

CONCLUSION

From our study we conclude that in elective caesarean section after the extraction of the placenta, 2 units of bolus oxytocin followed by 10 units per hour infusion for 2 hours is adequate enough for a good uterine contraction with no change in blood loss when compared to 5 units bolus oxytocin followed by 10 units per hour infusion for 2 hours. Moreover, haemodynamic stability is better in 2 units regimen with less hypotension and minimal tachycardia. Hence, use of rescue drugs for hypotension and emesis is also less compared to the 5 units regimen.

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