Volume : 3 | Issue : 2 | February 2014 • ISSN No 2277 - 8179

Research Paper

Oxytocin in Caesarean Section : the "Less Is More" Regimen

Medical Science

KEYWORDS : Caesarean section, Subarachnoid Block, Oxytocin, Uterine tone

Dr. Tahil Ali Khan	MD (Anaesthesia) Resident, Department of Anaesthesiology, Gandhi Medical College, Bhopal
Dr. Ruchi Tandon	MD, Assistant Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal
Dr. Shikha Mehrotra	MD, Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal

ABSTRACT

INTRODUCTION AND OBJECTIVE :

Oxytocin remains the uterotonic of choice to prevent uterine atony in caesarean delivery and its prophylactic and therapeutic administration is justified because it reduces the incidence of PPH. However the ideal infusion regimen in elective caesarian sections has not been determined yet. The extrauterine effects of oxytocin specially hypotension and tachycardia are significant, particularly when administered in high doses or in bolus, more so in parturient with hypovolemia or preexisting alterations in CVS. Several dosing regimens have been studied, varying the dose and/or the rate of administration, in an attempt to establish the most adequate.

The objective of this study was to compare the hemodynamic effects, uterine tone and adverse effects between two doses of oxytocin (5 IU versus 3 IU in 15 ml NS over 5 min) in parturients undergoing caesarian section under Sub Arachnoid Block.

MATERIAL AND METHODS :

After taking informed consent, 80 parturients without any known risk factors for uterine atony, scheduled to undergo caesarean section under subarachnoid block, were randomly divided into 2 groups on the basis of dose of oxytocin to be given at the time of cord clamping

GROUP O5: Receiving 5 IU of oxytocin in 15 ml RL over 5 min

GROUP O3: Receiving 3 IU of oxytocin in 15 ml RL over 5 min

Uterine tone was assessed by a blinded obstetrician as either adequate or inadequate at 3 and 5 minutes after oxytocin infusion. Hemodynamic variables (heart rate, blood pressure) , oxytocin related effects(uterine tone, need for additional uterotonic drugs, blood loss) and adverse effects were recorded.

RESULTS AND CONCLUSION :

We observed that oxytocin infusion 3U results in less hemodynamic response than oxytocin 5U although the difference was not statistically significant. Our results indicate that adequate uterine tone can be achieved with small doses of oxytocin in patients undergoing caesarean section.

The results of this study suggest that the use of 5 units oxytocin as a standard dose to achieve adequate uterine tone during CS is excessive and reevaluation of dosing is required.

INTRODUCTION :

Oxytocin remains the uterotonic of choice to prevent uterine atony and its prophylactic and therapeutic administration after delivery , whether spontaneous or operative, is justified because it is said to reduce the incidence of PPH by about 40%[1]. However the ideal dose or infusion regimen of oxytocin in caesaran sections has not yet been determined[2],[3],[4]. Large doses of oxytocin are known to cause adverse effects, including hypotension, nausea, vomiting, chest pain, headache, flushing, myocardial ischemia, ST changes, pulmonary edema, and severe water intoxication with convulsions[2],[3],[5]. These effects are particularly important when administered in high doses or in bolus, more so in parturient with hypovolemia or preexisting alterations in CVS. However, these effects are not widely appreciated by clinicians as highlighted in the Confidential Enquiry into Maternal Deaths (CEMD) published in 2001[6],[7]. The significant haemodynamic changes from administering 10 u of oxytocin could have contributed to the deaths of two women who were had a compromised cardiovascular status. Pinder and colleagues studied the haemodynamic effects of i.v. boluses of oxytocin, 5 and 10 u, in women undergoing Caesarean section under spinal anaesthesia and confirmed the dose-related effects of oxytocin[3]. An inadequate dose, on the other hand, carries the risk of increased uterine bleeding and associated complications.

The most recent editions of major obstetric and anaesthesia texts, either avoid mentioning an oxytocin dose during cesarean delivery or provide a range of 5-40 IU and the current guidelines for the administration of oxytocin during cesarean delivery are diverse, empiric, and vague. Despite the controversy it seems more anaesthetists are using dose of 5 IU as mentioned in various literatures whereas in a dose finding study by Butwick and colleagues, it was found that doses as low as 0.35 IU is sufficient in non labouring patients whereas labouring patients require a dose of 2.99 IU[8].

With this background, this study was undertaken in the Department of Anaesthesiology, Gandhi Medical College and associated Sultania Zanana Hospital, Bhopal with the objective to compare the uterine tone and hemodynamic effects along with adverse effects between 5 IU and 3 IU of oxytocin given as continuous infusion over 5 minutes in parturient undergoing caesarian section under SAB. Secondary objective was to study the effects of active labour pains on uterine contraction, requirement of oxytocin and need for additional uterotonics.

MATERIAL AND METHODS :

After obtaining clearance from institutional ethics committee, 80 healthy full term parturients of ASA grade I & II undergoing caesarean section were included in this randomized, double blind study. Patients with any known risk factor for uterine atony or cardiovascular instability like placenta praevia, pregnancy induced hypertension, prolonged labour, leiomyomata were excluded from the study. So were the patients who were given oxytocin for induction.

After taking informed consent, patients were divided into two groups on the basis of oxytocin administration at the time of cord clamping:

Group O5: To receive 5 IU of oxytocin diluted to 15 ml over 5 minutes

Group O3: To receive 3 IU of oxytocin diluted to 15 ml over 5 minutes Of these 80 patients, 37 patients were having active labour pains at the time of induction of which 17 patients were in group O5 and 20 patients were in group O3

IV line was secured and all patients were administered 10-15 ml/kg of lactated ringer solution with Inj.Ranitidine 50 mg i.v.

Volume : 3 | Issue : 2 | February 2014 • ISSN No 2277 - 8179

& Inj. Metoclopramide 10 mg i.v.

Routine monitors were attached and preoperative HR, BP, RR, SPO2 recorded . Sub Arachnoid Block was administered using Bupivacaine 0.5% heavy 12.5 mg (2.5ml) via 25 G spinal needle in L3-L4 space in left lateral position. All patients were given supplemental oxygen. Level of sensory blockade was assessed by pinprick method and surgery was commenced once a level of T4-T6 was achieved.

Fall in BP >30% of the preoperative values at any moment during the surgery was treated with iv ephedrine 6mg and these patients were not included further in the study . Pulse rate and blood pressure were recorded just before the delivery of the baby and were regarded as baseline values.

Oxytocin infuson was started at the time of cord clamping in Group O5 as 5 IU and in patients of Group O3 as 3 IU diluted to 15 ml normal saline given over 5 minute using an infusion pump. Mean arterial pressure (MAP) and heart rate were recorded at 1,2,3,5,10,15,20 and 30 minutes from the start of oxytocin infusion. Uterine tone was assessed subjectively (there being no method of assessing the same objectively) by a blinded obstetrician as satisfactory or not at 3 and 5 min from the delivery of the baby. Subsequent to completion of oxytocin 5IU/3 IU via infusion pump, a separate infusion of oxytocin 40 IU in 1 litre of RL was commenced at 250 ml/h (i.e. 10 IU/ h for 4 h). Estimated blood loss was assessed by a blinded assistant and adverse effects like nausea, vomiting, chest discomfort, headache and flushes were noted in both the groups. Requirement of additional uterotonics was also noted and the protocol for additional uterotonics followed in our study was additional 5 IU oxytocin followed by Methylergometrine 0.2 mg IV followed by Carboprost 0.25 mg IM. For the purpose of study, Values are presented as mean (±SD range).The blood pressure and pulse rate at the time of delivery of the baby were regarded as baseline values. Maternal B.P and HR values were computed as % changes from baseline. Comparison of quantitative data between groups was done by unpaired t test. Data with p value<0.05 was considered significant.

RESULTS:

Both the groups were comparable with respect to their demographic profile. MAP and HR were similar in both the groups. There was a lesser fall in MAP observed in O3 group as compared O5 group with a maximum fall of 13.2% of baseline in O5 group as compared to 10.8 % in O3 group, though the difference was not statistically significant (p >0.05). There was a similar trend observed in pulse rate with lesser tachycardia observed in 3 IU group as compared to 5 IU group, again the difference between the two groups was not statistically significant. No difference was observed in estimated blood loss and other adverse effects like nausea, vomiting, flushing and headache between the two groups. There was no difference in uterine tone between the two groups, neither was the need for additional uterotonic drugs. There were 5 patients out of 80 in both the groups who required additional uterotonic, of which, 1 patient required additional 5 IU oxytocin whereas 4 patients required methylergometrine. The requirement of additional uterotonics was significantly higher in labouring women as compared to non labouring women, 5 of 37 patients with non satisfactory uterine tone were seen in labouring group as compared to none out of 43 in non labouring group.

Table 1 : Comparison of Mean Arterial Pressure between the two groups at measured intervals

	Group 05		Group 03		P value
Preoperative	90.1±4.9		90.8±4,1		>0.05
Baseline	81.1±5.3	% change from baseline	82.4±4.8	% change from baseline	>0.05
1min	79.3±5.2	-2.1%	80.2±3.7	-3.5%	>0.05
2min	77.1±4.4	-4.9%	79.3±5.9	-4.2%	>0.05
3min	74.4±4.5	-8.3%	78.5±4.1	-5.3%	>0.05
5min	71.6±3.2	-11.7%	75.1±5.9	-8.8%%	>0.05
10min	70.4±4.9	-11.9%	73.4±4.8	-10.9%	>0.05
15min	69.7±5.1	-13.2%	73.6±5.1	-10.8%	>0.05
20min	72.4±4.1	-10.7%	74.5±4.9	-9.8%	>0.05
30min	73.8±3.8	-9.0%	76.7±4.3	-7.2%	>0.05

Table 2: Comparison of Heart Rate between the two groups at measured intervals

	GROUP O3		GROUP O5		P value
Preoperative	85.1±4.9		87.8±4,1		>0,05
Baseline	87.1±5.3	% change from baseline	88.4±4.8	% change from baseline	>0.05
1min	87.3±5.2	+0.3%	89.2±3.7	+0.9%	>0.05
2min	88.1±4.4	+1.9%	90.3±5.9	+2.3%	>0.05
3min	88.4±4.5	+1.8%	91.5±4.1	+3.5%	>0.05
5min	90.6±3.2	+3.3%	93.1±5.9	+5.3%	>0.05
10min	91.4±44	+3.8%	95.4±4.8	+7.9%	>0.05
15min	90.7±5.1	+3.4%	96.6±5.1	+9.2%	>0.05
20min	91.4±4.1	+4.2%	95.5±4.9	+8.0%	>0.05
30min	89.8±3.8	+2.3%	91.7±4.3	+3%	>0.05

Table 3 : Comparison of Uterine Tone and need for additional uterotonics between the two groups

	5 iu group		3 iu group		p value
	Adequate	Inadequate	Adequate	Inadequate	
At 3 min	38	2	37	3	>0.05
At 5 min	38	2	38	2	>0.05

Table 4 : Comparison of uterine tone with reference to Active Labour Pains between the two groups

Labour Pains	Y				N			
Group	O5		O3		O5		O3	
Uterine Tone	S	NS	S	NS	S	NS	S	NS
Number of Patients	15	2	17	3	23	0	20	0

S = Satisfactory, NS = Not Satisfactory.

DISCUSSION :

Our study showed a lower fall in BP and lesser tachycardia in O3 than in O5 group , though the difference was not statistically significant. Patients in both the groups were haemodynamically stable, a fact that could be attributed to slow infusion rather than bolus oxytocin being used. No difference was observed in uterine tone, blood loss, incidence of adverse effects in our study. A significant difference was noted in uterine tone and need for additional uterotonics between labouring and non labouring patients, as all of the 5 patients who required additional uterotonics were in active labour. However dose of oxytocin had little bearing on degree of uterine retraction in O3 and O5 subgroups in labouring and non labouring patients. An interesting fact observed in our study was the relative ineffectiveness of supplemental oxytocin. Out of the 5 patients with inadequate

uterine retraction, only 1 responded to additional 5 IU of oxytocin and other 4 patients required methylergometrine. Probably indicating a "ceiling effect" of oxytocin where no further improvement in uterine tone is observed on increasing the dose of oxytocin[9]. The incidence of other oxytocin related side effects was low in our study, which could be attributed to slow infusion of low doses, further supporting the use of lower doses of oxytocin.

CONCLUSION :

It was observed in our study that adequate uterine tone can be achieved with smaller dose of oxytocin with better hemodynamic stability in patients undergoing caesarean section. The results of this study suggest that the use of 5 IU oxytocin as a standard dose to achieve adequate uterine tone during CS needs reevaluation.

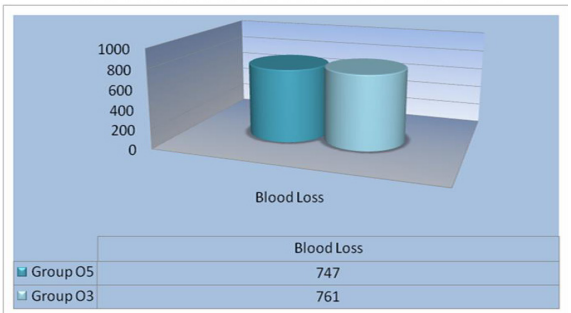
More specifically, we believe that the following points should be incorporated into a protocol:

- Initially, oxytocin should be used in doses of less than 5 IU.
- Higher initial doses of oxytocin appear to offer no clinical benefit and should be avoided.
- Use an ergot derivative or a prostaglandin rather than increasing the dose of oxytocin if the initial administration of oxytocin does not make the uterus contract effectively post delivery.

INFERENCE:

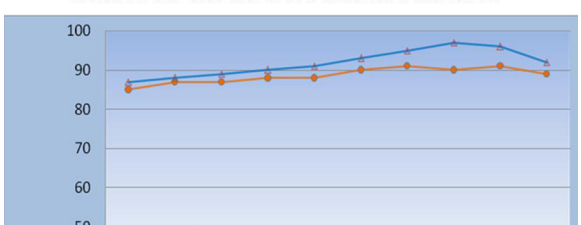
Why use more oxytocin when the patient is benefitted from less. In short, less is more…

GRAPH 4 : COMPARISON OF ESTIMATED BLOOD LOSS BETWEEN THE TWO GROUPS



	Blood Loss
Group O5	747
Group O3	761

GRAPH 3 : COMPARISON OF HEART RATE BETWEEN THE TWO GROUPS AT MEASURED INTERVALS



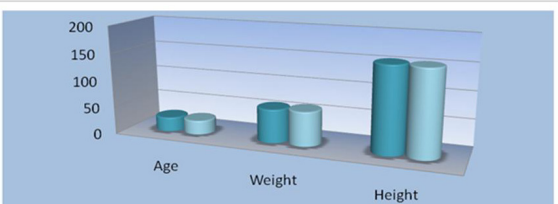
	Pre op	Baseline	1 min	2 min	3 min	5 min	10 min	15 min	20 min	30 min
Group O3	85	87	87	88	88	90	91	90	91	89
Group O5	87	88	89	90	91	93	95	97	96	92

GRAPH 2 : COMPARISON OF MEAN ARTERIAL PRESSURE BETWEEN THE TWO GROUPS AT MEASURED INTERVALS



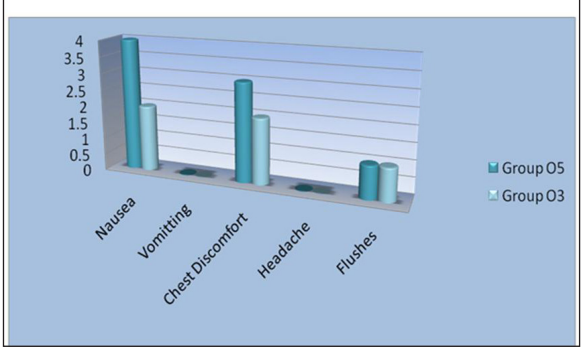
	Pre op	Baseline	1 min	2 min	3 min	5 min	10 min	15 min	20 min	30 min
Group O5	90	81	79	77	75	73	71	71	73	75
Group O3	91	82	80	79	79	75	73	72	74	77

GRAPH 1 : DEMOGRAPHIC PROFILE



	Age	Weight	Height
Group O5	26.4	61.3	156.1
Group O3	25.9	62.7	155.4

GRAPH 5 : COMPARISON OF ADVERSE EFFECTS BETWEEN THE TWO GROUPS



REFERENCE

1) Prendiville W, Elbourne D, Chalmers I. The effects of routine oxytocic administration in the management of third stage of labour. An overview of the evidence from controlled trials. Br Journal of Obstet Gynaecol 1988;95:3-16 | 2) Thomas JS, Koh SH, Cooper GM. Haemodynamic effects of oxytocin given as i.v. bolus or infusion on women undergoing Caesarean section. Br J Anaesth 2007; 98: 116–9 | 3) Pinder AJ, Dresner M, Calow C, O'Riordan J, Johnson R. Haemodynamic changes caused by oxytocin during caesarean section under spinal anaesthesia. Int J Obstet Anesth 2002; 11: 156–9 | 4) Munn MB, Owen J, Vincent R, Wakefield M, Chestnut DH, Hauth JC. Comparison of two oxytocin regimens to prevent uterine atony at cesarean delivery: a randomized controlled trial. Obstet Gynecol 2001; 98: 386–90 | 5) Svanstro¨m MC, Biber B, Hanes M, Johansson G, Na¨slund U, Ba°lfors EM. Signs of myocardial ischaemia after injection of oxytocin: a randomized double-blind comparison of oxytocin and methylergometrine during Caesarean section. Br J Anaesth 2008; 100: 683–9 | 6) Why Mothers Die 1997–1999. Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. London: RCOG Press, 2001; 134–49 | 7) British National Formulary, 54th Edn. London: BMJ Publishing Group Ltd and RPS Publishing, 2007; 415–6 | 8) Carvalho JC, Balki M, Kingdom J, Windrim R. Oxytocin requirements at elective cesarean delivery: a dose-finding study. Obstet Gynecol 2004; 104: 1005–10 | 9) Phaneuf S, Rodriguez LB, TambyRaja RL, MacKenzie IZ, Lopez BA. Loss of myometrial oxytocin receptors during oxytocin-induced and oxytocin-augmented labour. J Reprod Fertil 2000; 120: 91–7 |