Spinal anesthesia for caeserian section: comparison of 5.0% lignocaine and 0.5% bupivacaine

B Pradhan

Department of Anesthesiology, Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu, Nepal

Corresponding author: Dr. Bishwas Pradhan, MD, Asst. Professor, Department of Anesthesiology, Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu, Nepal; e-mail: biswaspradhan@yahoo.com

ABSTRACT

Objective of the study was to compare the effect of the drugs, intraoperative hemodynamic variables (heart rate, blood pressure) and associated complications (hypotension, nausea, shivering etc) between the bupivacaine and lignocaine group, when administered intrathecally in patients undergoing caesarean section. This is a randomized prospective study where the haemodynamic changes and the complications following sub arachnoid block either with 5.0% lignocaine or with 0.5% bupivacaine in 52 patients undergoing caeserian section were compared. The patients were randomly divided in two groups, group X (lignocaine group, n=26) or group B (bupivacaine group, n=26), either to receive 5.0% lignocaine 75 mg or 0.5% bupivacaine 12.5 mg. Intraoperatively heart rate, blood pressure (systolic (SBP), diastolic (DBP) and mean (MAP)), oxygen saturation were monitored. Any rescue drugs e.g. mephentermine, crystalloid 200ml bolus, pethidine, diazepam etc given were noted with the dose and time. Urine output and total amount of fluid given was noted at the end of the surgery. Oxytocin 10U in infusion was given after the baby was delivered in all the cases. Intraoperative blood pressures, total amount of fluid given, rescue vasopressor (mephentermine) given were compared in both the groups. Groups were also compared with respect to the patients' age, height of sensory block, motor block, duration of surgery, Apgar score and weight of the baby and duration of postoperative analgesia. It was concluded that the drugs were similar with respect to their sensory and motor effects, intraoperative hemodynamic changes like hypotension and bradycardia, and other complications like shivering and can be used interchangeably as spinal anesthetic agent for caesarean section deliveries.

Keywords: Bupivacaine, caesarean section, haemodynamics, spinal anesthesia, lignocaine.

INTRODUCTION

Spinal anesthesia, among the regional anesthesia, is a popular method for caesarean section deliveries. It is considered to be safe and effective, even for the urgent caesarean delivery. It not only produces rapid and intense block but also reliable block without missed segments.

However it is not free of complications as the drugs used for the sub arachnoid block produces its effect with sympatholysis of the spinal segments.

In this study, two drugs, lignocaine and bupivacaine are compared for their onset and duration of action as well as hemodynamic effects and other complications when used intrathecally in the patients' undergoing caesarean section deliveries.

MATERIALS AND METHODS

After obtaining the permission from the hospital authority and the informed consent from the patient and patient party, 52 pregnant patients planned for caeserian section either electively or in emergency was enrolled in the study. Patients with medical conditions such as diabetes, pregnancy induced hypertension, pre-eclampsia, eclampsia and cardiac disease were excluded from the study.

The patients were randomly divided into two groups, either group X (5.0% lignocaine) or group B (0.5% bupivacaine) according to the group in closed envelope upon arrival in operation theatre. The patients received 10 mg of metoclopramide and 50 mg of ranitidine intravenously (I/V) as premedication before transferring in operation theatre. All the patients were preloaded with 500 ml of lactated ringer's solution prior to sub arachnoid block over 10 mins. The intraoperative monitors used were heart rate (HR), electrocardiogram (ECG), non invasive blood pressure (NIBP) (systolic, diastolic and mean blood pressure), oxygen saturation (SpO2) and urine output. All the baseline variables were noted.

The patients were turned in left lateral position and subarachnoid block was given with 26 Gz Quincke spinal needles through L3/L4 interspace via median approach. The patients received either 1.5 ml 5.0% lignocaine heavy or 2.2 ml of 0.5% heavy bupivacaine as anesthetic agent intrathecally according to the group division. The patients were turned to supine position after drug

Table-1: Comparison of different variables between lignocaine and bupivacaine group.

	Bupivacaine	Lignocaine	P value
Age (in years)	25.5 ± 8.5	25.4 ± 8	0.42
Cases			
Elective	5 (19.2%)	3 (11.2%)	
Emergency	21 (80.8%)	23 (88.5%)	0.352
Motor block			
Ankle joint	2 (7.7%)	0	
Knee joint	4 (15.4%)	1 (3.8%)	0.113
Hip joint	20 (76.9%)	25 (96.2%)	
Sensory block			
Thoracic segment	T 4.8	T 4.4	
Sex of new born baby			
Female	11 (42.3%)	16 (61.6%)	
Male	15 (57.7%)	10 (38.6%)	0.165
Rescue drugs required			
Fluid 200ml bolus	12 (46.15%)	13 (50.0%)	0.333
Mephentermine 6 mg	11 (42.30%)	13 (50.0%)	0.389
Atropine 0.3 mg	1 (3.8%)	1 (3.8%)	0.977
Diazepam 5mg	0	4 (15.4%)	0.243
Analgesics used			
Diclofenac	17 (65.4%)	16 (61.5%)	
Pethidine	9 (34.6%)	10 (38.5%)	0.773
Others			
	Mean ± SD	**Mean ± SD**	
Baseline			
HR	94±14	100±18	0.20
SBP	128±14	123±18	0.31
DBP	76±13	84±13	0.23
MAP	96±12	96±12	0.90
SpO2	99±1	99±1	0.71
Urine Output in ml	228.40 ± 116.89	180.78 ± 115.83	0.15
Surgery time in mins	37.20 ± 13.08	38.35 ± 13.94	0.76
Fluids infused in ml	1556 ± 290.23	1557.69 ± 291.44	0.98
Synto time in mins	12.28 ± 3.95	11.54 ± 4.03	0.51
Time to 1st analgesic	6.3 ± 2.38	4.5 ± 2.19	0.57
Baby delivery time	13.24 ± 6.64	11.54 ± 4.03	0.27
Complications			
None	9 (30.7%)	6 (23.1%)	
Hypotension	8 (30.7%)	7 (26.9%)	
Hypo/Brady	1 (3.8%)	1 (3.8%)	
Hypo/Shivering	2 (7.6%)	3 (11.5%)	
Hypo/Shiver./Nausea	1 (3.8%)	1 (3.8%)	
Shivering	3 (11.5%)	3 (11.5%)	
Epigastric pain	0	4 (15.4%)	
Nausea/Vomiting	1 (3.8%)	0	

Data were analyzed using student *t* test and Chi-square test. P value < 0.05 is considered significant

injection was completed and vitals were recorded after 1 min of sub arachnoid block and then every 2.5 min for first 10 min and every 5 mins till the end of the surgery. The patients were given supplemental oxygen via nasal prong at the rate of 2litre/min (L/min). Level of sensory blockade was assessed with loss of cold sensation to alcohol swab along the anterior axillary line on the trunks and lateral aspect of leg. Motor block was assessed as unable to move ankle joint, knee joint or hip joint.

Intraoperative maintenance fluid given was ringer's lactate at the rate of 30 ml/hour. Any reduction of systolic blood pressure and/or mean arterial pressure 30.0% from baseline were considered as hypotension. Heart rate of less than 50/min was considered as bradycardia. Hypotension was treated initially with 200 ml bolus of lactated ringer's solution and if the blood pressures do not rise with that intervention, the patients received mephentermin 6mg in intermittent bolus doses observing at least 5 mins between the subsequent drug administrations. Bradycardia was treated with 0.3 mg bolus dose of atropine. Shivering during surgery was treated initially by warming the patient with the fan heater and warm saline. If this measure failed, pethidine 20 mg was given intravenously. Epigastric discomfort during uterine manipulation or exteriorization was treated with stopping the uterine manipulation first and if not relieved, patient was sedated with 5 mg of diazepam or 25 mg ketamine intravenously. The patients were transferred to post operative ward after the completion of surgery. Verbal contact with the patients was maintained at all times during the surgery period.

Time to first analgesic requirement was noted along with the dose. Analgesic prescribed in the post operative ward was either pethidine 50 mg with promethazine 25 mg SOS and diclofenac 75 mg intramuscular (I/M) 8 hourly. The patients either received pethidine 50 mg with promethazine 25 mg intramuscularly or diclofenac 75 mg intramuscularly.

The patients' were also enquired about the transient radicular irritation (TRI) and/or transient neurological symptoms (TNS) in the post operative period.

All the data were analysed by using t test and Chi-Square test. The data were analysed with stastical methods using Pentium III version of computer using statistical package for social science (SPSS). P< 0.05 was regarded as statistically significant.

RESULTS

The results were compared with respect to age of the patients, sensory and motor levels achieved with the respective drugs, hemodynamic variables, complications and postoperative analgesia requirements.

he spinal blockade with lignocaine and bupivacaine respectively was mean sensory block of $T_{4.4}$ and $T_{4.8}$, motor blockade at the level of ankle none and 2 (7.7%), knee 1 (3.8%) and 4 (15.4%), hip joint 25 (96.2%) and 20 (76.9%). The maximum effect was obtained in 3.5 mins and 8.35 mins respectively in lignocaine and bupivacaine group. Blockade of sensory level and motor level was statistically not significant in both the groups.

There were no significant difference in the intraoperative SBP, DBP, MAP, oxygen saturation and heart rate at any time in between the two groups.

Adverse events were divided as hypotension, hypotension and bradycardia, hypotension and shivering, hypotension, shivering and nausea, shivering only, nausea and vomiting, epigastric pain and none groups. Hypotension only was noted in 31.0% (n=8) in both the groups. Four percent (n=1) of patients in both groups had hypotension with bradycardia. Eight percent (n=2) of patients in group B and 12.0% (n=3) patients in group X experienced hypotension and shivering. Four percent (n=1) of patients in both the groups had hypotension, shivering and nausea as intraoperative complications. Twelve percent (n=3) of patients in both the groups had shivering only as complication. Eight percent (2) of patients in group B had nausea and vomiting whereas 15.0% (4) of patients in group X had epigastric pain only. Thirty five percent (n=9) of patients in group B and 23.0% (n=6) of patients in group X did not experience any of the complications.

For the management of hypotension 12 (46.0 %) of patients in bupivacaine group and 13 (50.0 %) of patients in lignocaine group received bolus of 200 ml of lactated ringers' solution (P-0.33); 11 (42.0 %) of patients in bupivacaine group and 13 (50.0%) of patients in lignocaine group required mephentermine administration for treatment of hypotension (P-0.39). Bradycardia in both the groups (n=1) required atropine 0.3 mg bolus for treatment (P-0.98). In bupivacaine group, 4 patients out of 6 required Pethidine 20 mg I/V for treatment of shivering whereas all 7 patients experiencing shivering in lignocaine group had to be treated with Pethidine 20 mg I/V. All the 4 (15.0%) patients in lignocaine group were given diazepam 5 mg for the treatment of epigastric pain whereas none of the patient in bupivacaine group experienced this complication (P-0.24). There were no statistically significant differences in the complications group.

Mean surgery time were 37.20 (± 13.08) mins and 38.35 (± 13.94) mins in bupivacaine and lignocaine group respectively (P-0.76). Fluids infused were mean volume of 1556 (± 290.23) ml and 1557.69 ± 291.44 ml in bupivacaine and lignocaine group respectively (P-0.98). Urine output at the end of surgery was 228.40 (± 116.89) ml and 180.78 (± 115.83) ml in bupivacaine and lignocaine groups respectively (P-0.15).

Duration of surgery (P - 0.764) was also comparable in both the groups (Table-1).

Similarly, times from incision to delivery of baby in both the groups were not significant statistically (P- 0.51) (Table-1).

Syntocinon administration was 12.28 (± 3.95) mins and 11.54 (± 4.03) mins after initiation of surgery in bupivacaine and lignocaine groups respectively (P-0.51). Time to first analgesia in post operative period was mean hour of 6.3 (± 2.38) hours and 4.5 (± 2.19) hours in bupivacaine and lignocaine groups respectively (P-0.57).

None of the patients in both the groups complained of TRI or TNS in the post operative period.

All the neonates had average APGAR scores of 7 and 8.5 in lignocaine group and 7.3 and 8.9 in bupivacaine group at one minute and five minutes.

DISCUSSION

Spinal anesthesia for caesarean section is considered to be safe and effective, even for the urgent caesarean delivery.[1] It is a simple technique that requires a small dose of local anesthetic to provide surgical anesthesia which produces rapid, intense and reliable block without missed segments.[2-4] For all the above reasons, spinal anaesthesia is considered to be safe in comparison to general anaesthesia.

Heavy bupivacaine and heavy lignocaine are the popular anesthetic agents used for the sub arachnoid block.[5,6] As caesarean section is considered to be of relatively predictable duration, lignocaine heavy is equally popular anesthetic agent for sub arachnoid block.[5] However its use has decreased considerably due to its side effect like transient radicular irritation.[7]

Cephalad spread of the drugs was similar in both the groups and was comparable with the reports of

Vichitvejpaisal P *et al* and Toft O *et al*. for the hyperbaric solution of bupivacaine and lignocaine.[6,8] However the motor block was higher in lignocaine group than in bupivacaine group. (Table 1) The time for duration of effect was also less in lignocaine group than in bupivacaine group. Time for maximum effect obtained is comparable with the study done by Toft P *et al* and Russell IF.[8,9]

The dose of both the drugs used for spinal anaesthesia is also comparable with the study of Aouad MT *et al* also and is widely accepted.[10]

There are reports of transient radicular irritation and/or transient neurological symptoms in patients who are given lignocaine as spinal anesthetic agents.[11,12] However it was not observed in any of the patients in both the groups in this study, with similar reports in the study carried out by Aouad MT *et al* and Wong CA *et al*.[10,13]

There were no significant differences with regard to change in systolic, diastolic and mean arterial pressure as well as with regard to heart rate and oxygen saturation in both the groups. This finding was also comparable with the study carried out by Kyokong O *et al*.[14]

Incidence of hypotension, hypotension with bradycardia, hypotension and shivering, hypotension, shivering and nausea, shivering only were noted in both the groups without much difference statistically. However nausea and vomiting were noticed in bupivacaine group only in two patients and epigastric pain was noted in four patients in lignocaine group. The incidence of hypotension and nausea were similar to the study carried out by Juhani TP *et al*, where it was 42.0% and 14.0% respectively in the bupivacaine group.[15]

Bupivacaine and lidocaine can be used interchangeably for spinal anaesthesia for caesarean section without significant difference in the incidence of intraoperative complications like hypotension, however longer duration of post operative analgesia produced by bupivacaine may make it preferable to lignocaine.

ACKNOWLEDGEMENTS

My sincere thanks to gynaecology and obstetric department for their encouragement and my personal thanks goes to anesthesia assistants Mr. Tej Thapa and Mr. Sundar, of Siddhartha Hospital, Butwal for their sincere and continuous support, without whose help this study could not have been carried out.

REFERENCES

1. Marx GF, Luykx WM, Cohen S. Fetal – neonatal status following caesarean section for fetal distress. *Brit J Anesthesia* 1984; 56: 1009-12.
2. Rawal N, Schallin J, Wesstrom G. Epidural versus combined epidural block for caesarean section. *Acta Anesthesiol Scand* 1988; 32: 61-6.
3. Covino BG. Rationale for spinal anesthesia. *Int'l Anesthesiol Clin* 1989; 27: 8-12.
4. Hunt CO. Spinal anesthesia for obstetrics. *Int'l Anesthesiol Clin* 1989; 27: 26-30.
5. Kumar A, Bala I, Bhukal I. Spinal anaesthesia with lidocaine 2% for Caeserean section. *Canadian J Anesthesia* 1992; 39: 915-9.
6. Vichitvejpaisal P, Svastdi-Xuto O, Udompunturux S. A comparative study of isobaric and hyperbaric solution of bupivacanie for spinal anaesthesia in Caesarean section. *J Med Assoc Thailand* 1992; 75: 278-82.
7. Jankowska A, Veillette Y. Comparison of differential blockade during spinal anesthesia using isobaric vs hyperbaric lidocaine 2%. *Canadian J Anesthesia* 2000; 47: 137-42.
8. Toft O, Brunn-Mogensen C, Kristesen J, Hole P. A comparison of glucose-free 2% lidocaine and hyperbaric 5% lidocaine for spinal anesthesia. *Acta Anaesthesiol Scand* 1990; 34: 109-13.
9. RusseL IF. Spinal anaesthesia for Caeserean section: the use of 0.5% bupivacaine. *Brit J Anesthesia* 1983; 55: 309-13.
10. Aouad MT, Siddik SS, Jalbout MI, Baraka AS. Does pregnancy protect against intrathecal lidocaine-induced transient neurologic symptoms? *Anesth Analg* 2001; 92: 287-90.
11. Hampl KF, Schneider MC, Ummenhofer W, Drewe J. Transient neurologic symptoms after spinal anesthesia. *Anesth Analg* 1995 Dec; 81: 1148-53.
12. Keld DB, Hein L, Dalgaard M, Krogh L.The incidence of transient neurologic symptoms (TNS) after spinal anaesthesia in patients undergoing surgery in the supine position. Hyperbaric lidocaine 5% versus hyperbaric bupivacaine 0.5%. *Acta Anaesthesiol Scand* 2000; 44: 285-90.
13. Wong CA, Slavens P. The incidence of transient radicular irritation after spinal anesthesia in obstetric patients. *Reg Anesth Pain Med* 1999; 24: 55-8.
14. Kyokong O, Charuluxananan S, Pothimamaka S, Leerapun R. Hypotension in spinal anesthesia for caesarean section: a comparison of 0.5% hyperbaric bupivacaine and 5.0% hyperbaric lidocaine. *J Med Assoc Thailand* 2001; 84: 256-62.
15. Juhani TP, Hannele H. Complications during spinal anesthesia for caesarean delivery: a clinical report of one year's experience. *Regional Anesth* 1993; 18: 128-31.