ORIGINAL ARTICLE

HAEMODYNAMIC PRESERVATION IN CAESAREAN SECTIONS BY LOW DOSE 0.5% HYPERBARIC BUPIVACAINE

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Background: Spinal anaesthesia is technique of choice for caesarean sections and hyperbaric bupivacaine is a recommended drug for this popular block. Although safe but few complications are haemodynamic changes, postdural puncture headache, cauda equina syndrome and radiculopathy. However, hypotension remains the common side effect which is believed to occur in 95% of patients resulting in reduction of uteroplacental perfusion causing foetal acid-base abnormalities. Various doses regimes are in safe anaesthesia practice for providing regional anaesthesia for such patients with least detrimental effects on foetal outcome. This study was carried out to find the effective dose of 0.5 % hyperbaric bupivacaine in caesarean section patients by comparing two different doses. **Methods:** After enrolling two hundred patients of C section (Caesarean section) for this study, 90 patients were selected to compare the effects of 0.5% hyperbaric bupivacaine. Group A (n=45) received 10 mg of drug while group B (n=45) received 12 mg for spinal anaesthesia. Onset of block, sensory and motor level, haemodynamic changes, surgery time, maternal satisfaction, Apgar score and incidence of complications were compared in two groups. **Results:** Blood pressure decreases were less in Group A (*p*-0.074) but not statistically significant. Phenylephrine for hypotension was given to 17% vs 5% in group B. Maternal satisfaction was found to be better in group B 33 vs 17 but was statistically significant (*p* 0.034). 2% patients had bradycardia in group A which was treated by atropine. No complications were reported in either group. **Conclusion:** Doses of hyperbaric bupivacaine for spinal anaesthesia in caesarean sections must be at least 12 mg because it produces excellent anaesthesia and maternal satisfaction without complications.

Keywords: Hyperbaric bupivacaine 0.5%; Spinal anaesthesia; C-section; Bupivacaine;

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INTRODUCTION

Anaesthesia of choice for caesarean sections (C sections) is spinal since it is easier to perform, has rapid predictable onset and may produce intense block with less chances of serious drug toxicity if performed correctly with smaller doses.[1] This type of anaesthesia has been proved extremely safe, but is not without complications. The complications are haemodynamic changes, postdural puncture headache, cauda equina syndrome and radiculopathy.[2] However, hypotension remains the common side effect resulting in reduction of uteroplacental perfusion causing foetal acid-base abnormalities. Moreover these effects compromise cardiovascular, hepatic and renal blood flow further deteriorating the normal physiologic functions.[3] The conventional teaching is to use sufficient doses of local anaesthetic agent to produce a block but it produces hypotension in most cases. The resultant effects of low dose used in spinal anaesthesia are less haemodynamic stability, rapid recovery from block and few side effects which had been seen in many studies.[4,5] The basic mechanism behind cardiovascular changes is sympathectomy and its effects depend upon the height of block, a relation which is always unpredictable. Multiple other factors contribute to hypotension like hypovolaemia, high sensory block, preoperative hypertension etc.

The use of low dose local anaesthetic agent was found to generate a less intense intra operative motor blockade with similar spread of the sensory block which is a matter of interest. Various studies have described the advantageous effects of using low dose hyperbaric bupivacaine for spinal anaesthesia alone or combining opioids in C section by producing less haemodynamic variations. Future studies may find some better alternative for intrathecal block while minimizing side effects. We conducted this study to compare the effects of two different doses of hyperbaric bupivacaine to find the minimum effective dose for spinal anaesthesia.

MATERIAL AND METHODS

After ethical committee's approval, a written informed consent was obtained from 90 healthy ASA 1 and 2 females undergoing elective and semi emergent C section under spinal anaesthesia. They were randomly divided into two equal groups, A (n=45) and B (n=45). Ringer's Lactate 10–15 ml/Kg was infused as preload prior to any intervention. Semi-emergency operations were preloaded with

Rapid infuser while spinal anaesthesia was attempted. Intrathecal midline injection in sitting position was at L3-4 interspace with neck flexed. A 25 G Quincke spinal needle was standard needle for all patients. Group A received 10 mg of 0.5% hyperbaric bupivacaine while 12 mg of same was used in group B. After intrathecal drug injection patients were immediately returned to supine with 10–15 degree head down position with pillow under head for the drug to spread upward to achieve T4-6 dermatome level and a wedge was placed under right hip for left lateral tilt. After the injection, another anaesthetist took over the charge. Surgery was started once the blockade was confirmed with gentle pin prick and inability of patient to raise her legs.

After baseline recording, further readings were taken at every 5 min till the end of surgery along with the pulse, ECG, SpO_2. Hypotension occurring following spinal anaesthesia was recorded and systolic arterial pressure below 90 mm Hg was considered to be significant. Nausea and vomiting if any was noticed. Phenylephrine 50–100 ug bolus was used to treat hypotension and atropine 0.4–0.6 mg was given for heart rate less than 50 beats per min. Ringer's lactate was infused rapidly along with drugs to counter hypotension. Patients of known allergy, known hypersensitivity to any of the medication, active labour, urgent or emergent operation, cardiac, renal, neurologic or other organ system disease, failed spinal and patients refusing participation were excluded.

No intravenous phenylephrine was given until hypotension occurred (BP <90 mm Hg). Bradycardia was defined as heart rate less than 50 beat/min and treated with intravenous atropine of 0.4–0.6 mg. Total no of drugs given to each patient were recorded. Metoclopramide 10 mg IV and dexamethasone 4 mg IV was given to all patients for preventing nausea and vomiting. Patients discomfort was treated with propofol 20 mg pre-delivery, and nalbuphine 3–5 mg was given to patients post-delivery. Ketamine 20 mg was given in case if a patient required additional drug. Maternal satisfaction with intraoperative anaesthesia technique was recorded in the post-operative period with 'poor' and 'satisfactory' response. Patients were kept under study period till the recovery of motor and sensory reflexes.

Data was analysed using SPPS 14.0 software. Sample size was calculated from the previous trial comparing high and low dose spinal anaesthesia in caesarean section patients.[7] Confidence interval was 95% and P value less than 0.05 was considered significant. Power of study was set to 80%. Results were expressed as count, percentages, mean ±SD and paired sample *t* test (*p*-value).

RESULTS

The onset of analgesia and motor blocks with group B found to be faster when compared to hyperbaric bupivacaine low dose in group A (5.3±2.2 versus 5.9±2.3 minutes and 4.1±2 versus 5.4±2 minutes). Phenylephrine was given to 8 (17%) patients in group A vs 10 (22%) in group B. Incidence of sensory block above T4, nausea and vomiting were higher in group B than in group A but they were not significant. Similarly, arterial hypotension was less frequent in group A (25% vs 33%; p=0.074). The satisfaction rate was higher than in group B (satisfactory and poor in 73% vs 37% p=0.03) and duration of sensory and motor blocks was longer in group B when compared to low dose group A (190±25 versus 180±22 minutes and 210±32 versus 163±24 minutes). Figure-1: Trend of systolic blood pressure after spinal anaesthesia in two groups against time. There was statistically no significant difference in systolic blood pressure of two groups

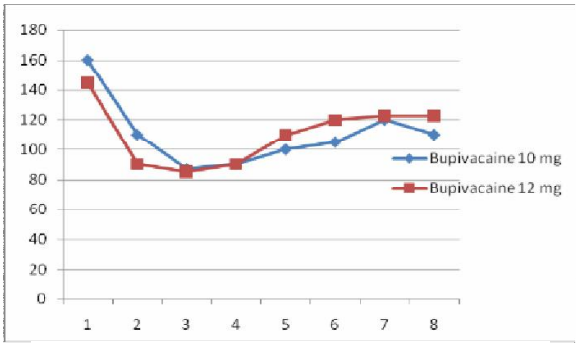

Figure-1: BP trend comparison of two groups

Table-1: Demographic Data (Mean±SD)

	Group-A	Group-B	Remarks
Age	26.3±4.4	26.2±4.3	
Weight	72.9±10.03	71.4±10.09	
BP baseline	128.3±16	115.2±14	
Parity (count)			
Primigravida	8	13	23.3%
Previous 1	24	19	47.8%
Previous 2	10	9	21.1%
Previous 3	3	3	7.8%
Surgical duration	54.2±8.9	53.6±9.1	
Two segment regression	192.9±13.2	205.4±15.2	
Phenylephrine not given	25 (55%)	32 (71%)	63%
Given	8 (17%)	10 (22%)	20%
Ketamine/ Nalbin given	12 (26%)	3 (6%)	16.7%

Table-2: Comparison of hypotension and maternal satisfaction

	Group-A	Group-B	*p*-value	Remarks
Maternal satisfaction	17 (45)	33 (45)	0/034	$p<0.05$
Hypotension	25 (45)	33 (45)	0.074	$p>0.05$

DISCUSSION

Various therapeutic regimes are suggested for use in spinal anaesthesia for C sections to provide effects like less hypotension, better neonatal outcome, maternal satisfaction and surgical anaesthesia. Most of these studies recommend use of opioids in combination with low dose local anaesthetic agent either single shot or combined spinal epidural technique. We compared two groups of C-sections with spinal hyperbaric bupivacaine 0.5% alone without combining opioid. Demographic data (Table-1) highlighting age, weight, baseline systolic blood pressure, surgical duration, block duration was similar in low doses 10 mg and 12 mg groups. Our findings suggest that decreasing spinal local anaesthetic dose in C section has beneficial haemodynamic effects as shown in table-2 but the difference is statistically not significant (Table-2). Dense motor block was rarity with lower doses, preserving haemodynamic but resulted into poor maternal satisfaction as some females complained of poor anaesthetic experience. Higher doses of anaesthetic agent are found to be hypotensive in this most popular technique for C section[6] and the same fact has been proved in our study. To counter hypotension in higher dose group phenylephrine was required but the difference with low dose group was not significant. We tried to achieve T4-T6 levels by 10–15 degree head down position immediately following spinal anaesthesia with a pillow under head as blocks above T 4 may cause severe hypotension by cardiac sympathetic blockade.

Reves M and Pan PH[7] reported a case where very low dose spinal anaesthesia effects were studied in obese and pre eclamptic patient. Arzola C[8] conducted a systematic research of randomized controlled trials comparing the efficacy of low dose bupivacaine (≤8 mg and ≥8 mg) for preventing spinal hypotension in caesarean delivery. This study has suggested that some patients needed analgesic supplementation and same has been demonstrated in our study as ketamine 20 mg bolus was used to supplement patients in low dose group (Table-1).

Various combinations of opioid with local anaesthetic agents are recommended for this purpose and all have promising results.[9–12] Even cardiac patients tolerate this combination very well. Use of ketamine iv to supplement low dose spinal has been reported reported.[13–15] Non-availability of preservative free opioids limited our study to comparing effects of only bupivacaine whereas most studies used intrathecal drug combination. The patient related anxiety was the main concern for anaesthetist before starting surgery in low dose group and propofol 20 mg bolus doses provided temporary sedation. Further studies are suggested combining new local anaesthetic agent in low dose with opioid in high risk patients for better results.

CONCLUSION

Despite promising results of our study a combination of intrathecal opioid and low dose hyperbaric bupivacaine is presently considered to be the treatment of choice in spinal anaesthesia for caesarean sections for better haemodynamic maternal satisfaction, better neonatal outcome, and less side effects.

AUTHORS' CONTRIBUTION

MA: Concept, manuscript preparation, statistical analysis. MA: Proof reading, introduction. NA: Proof reading, references

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