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Comparison of Intra-thecal Bupivacaine and Levo-Bupivacaine in patients undergoing perineal and lower limb surgeries.

Anaesthesiology

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ABSTRACT

The dangers of long acting local anaesthetic Bupivacaine widely used for spinal anaesthesia if inadvertently gaining vascular access,led us to compare a reportedly less toxic agent Levo-bupivacaine with Bupivacaine for spinal anaesthesia in patients undergoing perineal and lower limb surgeries. 100 patients of either sex with physical status ASA grade I and II, aged 25 to 60 years, scheduled for perineal and lower limb surgeries under spinal anaesthesia were included in the study. Patients were randomly divided into two equal groups of 50 each.Patients were randomized to receive 3 ml of hyperbaric bupivacaine or levobupivacaine. The onset and duration of sensory block, onset and duration of motor block and duration of analgesia were recorded. The median highest level in both these groups was T6. The difference observed was statistically insignificant (p-value >0.05). The mean of onset of highest sensory block in bupivacaine group was 11.60 minutes & and that in the levobupivacaine group was 12.54 minutes. The difference observed was statistically insignificant (p-value >0.05). The mean time to achieve grade III motor block in bupivacaine group was 6.80 min. and that in the levobupivacaine group was 7.30 min. The difference observed was statistically insignificant (p-value >0.05).This study indicates that 0.5% hyperbaric levobupivacaine and 0.5% hyperbaric bupivacaine have equally effective potencies for spinal anaesthesia, both regards to onset of sensory and motor block, total duration of sensory and motor block and sensory regression to S2,however levobupivacaine has the added advantage of less toxic effects if accidently gone intravascular with a similar duration of sensory block as that of bupivacaine.

KEYWORDS:

Bupivacaine, Levo-Bupivacaine, Spinal ,Perineal,Lower limb.

Introduction:

Spinal anaesthesia is one of the methods of anaesthesia for all procedures carried out on the lower half of the body i.e. lower abdominal, subumblical, lower limbs, pelvis, genitals and perineum and for most of the urological procedures. It follows injection of local anaesthetic into the cerebrospinal fluid usually in the lumbar region at the level of L3-4 intervertebral space or below. This produces sympathetic, sensory and motor blockade, under the effect of which various surgeries can be undertaken. Spinal anesthesia has the advantage of quicker onset of action as compared to epidural block and is technically easier. Neuraxial blocks not only reduce the incidence of deep venous thrombosis, pulmonary embolism, cardiac complications, bleeding, transfusion requirements, respiratory depression but also provide effective post-operative analgesia1.

Presently a vast choice of local anaesthetics is available. However, their toxicity issues have blemished the history of local anaesthesia since its inception. With a resurgence of interest in regional anaesthesia in the nineteen sixties, the need for a longer acting local anaesthetic agent became apparent.

Bupivacaine, an amino amide compound was synthesized and introduced into the clinical practice in 1963, and it proved to be a very effective long acting local anaesthetic agent. Bupivacaine is available as a racemic mixture of its enantiomers, dextrobupivacaine and levobupivacaine. In 1979, Albright2 drew attention to the dangers of the longer acting local anaesthetic agents, bupivacaine and etidocaine, in case they gained accidental intravascular access. However, studies in animals indicate that bupivacaine, when injected intravascularly, induces a dose and rate dependent depression of drug elimination, resulting in re-entrant arrhythmias and cardiac depression, sometimes culminating in cardiac arrest3. These shortcomings of this otherwise novel local anaesthetic resulted in the development of never anaesthetic agent levobupivacaine.

Levobupivacaine the pure S(-)-enantiomer of racemic bupivacaine, is a new long-acting local anaesthetic that has recently been introduced in the clinical routine. Because of its significantly decreased cardiovascular4 and central nervous system5 toxicity as studied by various investigators, levobupivacaine seems to be an attractive alternative to bupivacaine. Numerous preclinical and clinical studies have compared levobupivacaine with bupivacaine and in most of the studies there is evidence that levobupivacaine is less toxic6. The reversibility of levobupivacaine-induced cardiotoxicity has also been assessed6. Some data point to an advantage of levobupivacaine over bupivacaine. Clinical studies have been conducted using surrogate markers of both cardiac and CNS toxicity. In these studies levobupivacaine or bupivacaine were given by intravascular injection to healthy volunteers. Levobupivacaine was found to cause smaller changes in indices of cardiac contractility and the QTc interval of the electrocardiogram and also to have less depressant effect on the electroencephalogram7.

Methods:

After the institutional ethical committee approval and written informed consent, 100 patients of either sex with physical status ASA grade I and II, aged 25 to 60 years, scheduled for perineal and lower limb surgeries under spinal anaesthesia were included in the study.

All patients were thoroughly evaluated preoperatively at least 24 hours before surgery. Complete medical history was taken including history about previous anaesthetic exposure, medications, allergy to any drug, personal habits. General physical examination, systemic examination of cardiovascular system, respiratory system, central nervous system and local examination of spine was also carried out. All investigations as per the proforma were taken into consideration. VAS (Visual Analog Scale) consisting of a 10 cm line with 0 - no pain and 10 cm - maximum imaginable pain, was explained to patients at preoperative visit.

Patients were randomly divided into two equal groups of 50 patients each. Randomization was done by dividing 100 patients into 50 pairs. Each pair received either drug by tossing of coin.

Group I- (Bupivacaine group, N = 50): These patients received 3.0ml out of a mixture of 3ml of 0.5% hyperbaric bupivacaine and 0.5ml of normal saline making a total of 3.5ml.

Group II- (Levobupivacaine group, N = 50): These patients received 3.0ml out of a mixture of 3ml of 0.5% isobaric levobupivacaine and 0.5ml of 50% dextrose making a total volume of 3.5ml. (By adding 0.5ml 0f 50% dextrose to 3ml of isobaric levobupivacaine, it becomes hyperbaric solution).

All drug solutions were prepared by an anaesthesiologist who was not involved in administration of spinal anaesthesia or in observation of the patient. No premedication was given to any patient. On arrival in operation theatre, an 18 guage cannula was secured in a peripheral vein and each patient was preloaded with 500ml of Ringers lactate. After this, patients were connected to an ECG monitor to record baseline systolic arterial pressure, diastolic arterial pressure and heart rate in semi-recumbent position. The patients were then placed in the sitting position and under all aseptic precautions a lumber puncture was performed with a 26 G Quinckes spinal needle at L3 – L4 intervertebral space.

Patients were randomly allocated to Bupivacaine group or Levobupivacaine group and received either 3.0ml out of a mixture of 3ml of 0.5% hyperbaric bupivacaine and 0.5ml of normal saline or 3ml out of mixture of 3ml of 0.5% isobaric levobupivacaine and 0.5ml of 50% dextrose respectively. After withdrawal of spinal needle an antiseptic seal was applied at the site of lumbar puncture. The time of injection was noted and patients were placed in supine position immediately. Onset of sensory block was checked by loss of sensation to pinprick. Sensory testing was performed using a blunted 21 G needle in a cephalad to caudal fashion. Dermatome level was tested every 2 minutes until the level was stabilized for 3 consecutive tests. A sensory blockade upto T10 was considered adequate. The time taken from intrathecal injection to the attainment of highest level of sensory block was recorded. Later, the time taken for sensory regression to S2 from the highest sensory level was also noted.

Motor block in the lower limbs was assessed as per Modified Bromage scale8:

0 - No paralysis
1 - Inability to raise extended legs
2 - Inability to flex the knee
3 - Inability to flex the ankle

Duration of motor blockade was recorded from the onset upto the cessation of grade I block.Hemodynamic variables such as systolic arterial pressure, diastolic arterial pressure and heart rate were recorded immediately after the injection, at 5 min., 10 min., 15 min., 30 min., 45 min., 60 min and at the end of the procedure. Hypotension was taken as a fall in baseline systolic arterial pressure by 20%. Hypotension was then treated with bolus doses of intravenous ephedrine 3mg. Bradycardia was taken as heart rate less than 50 beats per minute. Bolus doses of intravenous atropine 0.3 mg were injected to treat the episodes of bradycardia.

Patients were monitored for 24 hours for dizziness, post-operative nausea and vomiting. Post-operative analgesia was evaluated using a standard 10 cm linear visual analogue scale (VAS). Patients with a pain score of more than 3 on VAS were given rescue analgesia in the form of diclofenac sodium 50 mg intramuscularly. Duration of analgesia was recorded from its onset upto the time when pain was first reported.

Statistical analysis of the data was done using ANOVA and students t-test for difference of means (paired samples t-test). For quantitative analysis of nominal data, chi-square test (2-test) was used. These tests were two sided & were referenced for p-values for their significance. Any p-value less than 0.05 (i.e. p<0.05) was taken to be statistically significant.

Results :

All the patients in the two groups were homogenous with respect to age, (with mean age in bupivacaine group 48.72±11.77 and in levobupivacaine group 44.54±12.30) with p value of 0.09.The two groups were comparable with respect to weight (p value 0.92), gender distribution (p value 1.00) and surgical procedures (p> 0.05) done thereby avoiding the bias of these factors on the outcome of the study. The difference in heart rate (beats/minute) between the two groups at baseline, immediately after injection of the drug , 5 minute, 10 minute, 15 minute, 30 minute, 45 minute, 60 minute and at the end of procedure was statistically insignificant (p-value > 0.05).

The difference in systolic blood pressure (mmHg) between the two groups at baseline, immediately after injection, 5 minute, 10 minute, 15 minute, 30 minute, 45 minute, 60 minute and at the end of procedure was statistically insignificant (p-value >0.05).

The difference in diastolic blood pressure (mmHg) between the two groups at baseline, immediately after injection, 5 minute, 10 minute, 15 minute, 30 minute, 45 minute, 60 minute and at the end of procedure was statistically insignificant (p-value >0.05).

On comparing highest sensory level (T) between the two groups the median highest level in both these groups was T6. The difference observed was statistically insignificant (p-value >0.05).

The mean of onset of highest sensory block in bupivacaine group was 11.60 minutes & and that in the levobupivacaine group was 12.54 minutes. The difference observed was statistically insignificant (p-value >0.05).

The mean time to achieve grade III motor block in bupivacaine group was 6.80 min. and that in the levobupivacaine group was 7.30 min. The difference observed was statistically insignificant (p-value >0.05).

The mean duration of grade I motor block in bupivacaine group was 189.46 min. and that in the levobupivacaine group was 184.04 min. The difference observed was statistically insignificant (p-value >0.05).

The mean time of sensory regression to S2 in bupivacaine group was 245.42 min. and that in the levobupivacaine group was 242.18 min. The difference observed was statistically insignificant (p-value >0.05).

Comparison of time from Injection of drug to 1st complaint of pain between bupivacaine group & levobupivacaine group.

Group	Min.	Max.	Mean	SD	p value
Bupivacaine group	210	405	262.80	33.49	0.59 (NS)
Levobupivacaine group	206	401	259.18	33.64	

This table shows that the mean time from Injection of drug to 1st complaint of pain in bupivacaine group was 262.80 min. and that in the levobupivacaine group was 259.18 min. The difference observed was statistically insignificant (p-value >0.05).

Comparison of Side Effects between bupivacaine group & bupivacaine group

	bupivacaine		p value Levobupivacaine		
	n	%	n	%	
Hypotension	5	10	6	12	0.750 (NS)
Bradycardia	2	4	3	6	0.648 (NS)
Nausea/Vomiting	2	4	3	6	0.648 (NS)
Respiratory Depression	0	0	0	0	1.000 (NS)
Shivering	1	2	2	4	0.560(NS)

This table shows that the difference in side effects between the two groups was statistically insignificant (p-value > 0.05).

Discussion:

Spinal anaesthesia is widely used for lower limb and perineal surgeries9. A large number of drugs are used to perform this block out of which Levobupivacaine is stated to have an enhanced safety profile when compared to bupivacaine, a major advantage in regional anaesthesia. levobupivacaine is thus increasingly popular in replacement of bupivacaine because of its equipotency with lower cardiovascular and central nervous system side effects5.

Levobupivacaine has very similar pharmacokinetic properties to those of racemic bupivacaine10. The decreased cardiovascular4 and central nervous5 system toxicity make levobupivacaine an interesting alternative to racemic bupivacaine, despite the fact that spinal anaesthesia is achieved with small-dose regimens. Levobupivacaine is also worth considering for its anaesthetic potency and hemodynamic effects in the event of inadvertent intrathecal administration during epidural anaesthesia11.

Our decision to use hyperbaric levobupivacaine was based on fact that campared to plain solutions, use of hyperbaric local anaesthetic solutions results not only in a more predictable cephalad spread, but also increases the duration of the clinically useful block (given by duration at the T10), and leads to a more rapid regression of sensory block and recovery from motor block12,. Besides, by using both the hyperbaric solutions, the bias of baricity was eliminated in our study. We restricted the volume of levobupivacaine by adding 50% dextrose instead of 10% dextrose used by various investigators13 to make it hyperbaric.

Conclusion:

The present study indicates that 0.5% hyperbaric levobupivacaine and 0.5% hyperbaric bupivacaine have equally effective potencies for spinal anaesthesia, both regards to onset of sensory and motor block, total duration of sensory and motor block and sensory regression to S2. Incidence of adverse effects like hemodynamic alterations, shivering, nausea and vomiting were comparable between the groups, however, because of reportedly less toxic effects and greater margin of safety, levobupivacaine may be a preferred agent over bupivacaine in spinal anaesthesia.

References:

1. Kleinman W, Mikhail M. Regional anaesthesia and pain management. Clinical Anaesthesiology2006 4thed p270.
2. Albright G A. Cardiac arrest following regional anaesthesia with etidocaine or bupivacaine. Anaesthesiology1979;51:285-287
3. Clarkson C W, Hondeghem L M. Mechanism for bupivacaine depression of cardiac conduction. Anaesthesiology1985;62:396-405
4. Bardsley H, Gristwood R, Baker H, Watson N, Nimmo W. A comparison of the cardiovascular effects of levobupivacaine and rac-bupivacaine following intravenous administration to healthy volunteers. British Journal of Clinical Pharmacology1998;46:245–9.
5. Huang Y F, Pryor M E, Mather L E, Veering B. Cardiovascular and central nervous system effects of intravenous levobupivacaine and bupivacaine in sheep. Anaesthesia Analgesia1998;86:805-11.
6. Stefania Leone, Simone Di Cianni, Andrea Casati, and Guido Fanelli. A review on Pharmacology, toxicology, and clinical use of new long acting local anaesthetics, ropivacaine and levobupivacaine. Acta Biomed2008;79:92-105.
7. Gristwood R W. Cardiac and CNS toxicity of levobupivacaine: strengths of evidence for advantage over bupivacaine. Drug Safety 2002;25:153-63.
8. C J Chung, S R Choi, K H Yeo, H Park and Y J Chin. Hyperbaric spinal Ropivacaine for caeserian delivery: A comparison to hyperbaric Bupivacaine. Anaesthesia Analgesia2001;93:157-61.
9. J F Luck, P D W Fettes and J A W Wildsmith. Spinal anaesthesia for elective surgery: a comparison of hyperbaric solutions of racemic bupivacaine, levobupivacaine, and opivacaine. British Journal of Anaesthesia 2008;101:705-10.
10. Opas Vanna Lamai Chumsang and Sarinra Thongmee. Levobupivacaine and Bupivacaine in Spinal Anesthesia for Transurethral Endoscopic Surgery. Journal of Medical Association of Thailand2006;89:1133-9.
11. Glaser C, Marhofer P, Zimpfer G, Heinz M T, Sitzwohl C, Kapral S et al. Levobupivacaine versus racemic bupivacaine for spinal anesthesia. Anaesthesia Analgesia2002;94:194-8.
12. Fettes, PDW, Hocking, Peterson MK, Luck JF, Wildsmith JAW. Comparison of plain and hyperbaric solutions of ropivacaine for spinal anaesthesia. British journal of anaesthesia2005;94:107-11.
13. Elizabeth A Alley, Dan J Kopacz, Susan B McDonald and Spencer S Liu. Hyperbaric Spinal Levobupivacaine: A Comparison to Racemic Bupivacaine in Volunteers. Anaesthesia Analgesia2002;94:188-93.

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