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A COMPARATIVE STUDY BETWEEN 0.5% LEVOBUPIVACAINE WITH DEXMEDETOMIDINE AND 0.5% BUPIVACAINE WITH DEXMEDETOMIDINE IN SUBARACHNOID BLOCK

Anaesthesiology

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ABSTRACT

Introduction: Spinal anaesthesia provides profound muscular relaxation and analgesia which is ideal for intra-abdominal and orthopedic procedures. Bupivacaine has been one of the most common local anaesthetic agent used for subarachnoid block. The levo- enantiomer of bupivacaine is found to be less toxic compared to dextroisomer and racemic mixture. Dexmedetomidine which is an alpha-2 agonist is now being used as an adjuvant to hyperbaric bupivacaine to produce analgesia that is faster, more intense with prolonged sensory & motor blockade.

Materials and Method: A prospective randomized clinical trial was conducted at ALLURI SITARAMA RAJU ACADEMY OF MEDICAL SCIENCES, ELURU on 60 patients scheduled for elective lower abdominal, urologic and lower limb surgeries between 2017-2019.the patients are randomly divided into 2 groups. Group A received 0.5% isobariclevobupivacaine (15mg) with dexmedetomidine (5 µg) and Group B received0.5% hyperbaric bupivacaine (15mg) with Dexmedetomidine (5µg) in sub-arachnoid block. Sensory block assessed by loss of sensations by pinprick method. Motor blockade assessed by using bromage scale. Pain was evaluated by visual analogue scale.

Results: It was observed that the time of onset of sensory blockade was significantly shorter in Group B compared to Group A.The time taken to reach grade4 motor blockade was shorter with Group B compared to Group A. There was no significant difference between both the groups in relation to time for rescue analgesia and hemodynamic variations.

Conclusion: we conclude that 0.5% Isobaric Levobupivacaine with dexmedetomidine is a safer alternative to 0.5% hyperbaric racemic bupivacaine with dexmedetomidine for subarachnoid block.

KEYWORDS

Isobaric Levobupivacaine, Racemic Hyperbaric Bupivacaine, Dexmeditomidine, Subarachinoid Block.

INTRODUCTION:

The International Association for the Study of Pain —IASP defines pain as —an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Spinal anaesthesia provides profound muscular relaxation and analgesia which is ideal for intra-abdominal and orthopedic procedures. The wide spread popularity of spinal anaesthesia is due to the simplicity of the technique, high success rate, rapid spread of anaesthetic drugs and an awake cooperative patient. It also avoids the multiple drugs with their high doses and associated side effects of General anaesthesia.

Bupivacaine has been one of the most common local anaestheticagent used for subarachnoid block. But the darker side of Bupivacaine became evident with its potential for cardio toxicity. During exploration of its toxicity, the significance of stereochemistry has become evident. The levo- enantiomer of bupivacaine is found to be less toxic compared to dextroisomer and racemic mixture. Addition of opioids to local anesthetics is very commonly practiced .Various other drugs such as alpha-2 agonists are now being used as an adjuvant to hyperbaric bupivacaine to produce analgesia that is faster, more intense with prolonged sensory & motor blockade.

This study explores the efficacy of levobupivacaine with dexmedetomidine in comparison to racemic bupivacaine with dexmedetomidine in subarachnoid block.

MATERIALS AND METHODS:

After obtaining Ethical committee approval and written informed consent from the patients, study was conducted on 60 patients in the age group of 20-60 years of either sex of physical status American Society of Anesthesiologists (ASA) Classes I and II admitted for elective lower abdominal, urological, lower limbsurgeries under spinal anesthesia.

Patients who refused to undergo procedure, pregnant or lactating or with some coagulating/ neurological disorders or with spine deformities or local skin sepsis around the site of needle insertionor allergy to study drugs or with any life threatening diseases were excluded from this study.

All the patients after fasting for 6-8hrs prior to surgery were pre medicated with Tab. Ranitidine and Tab. Alprazolam 0.5mg. Patient was preloaded with an i.v. infusion of one liter of Ringer Lactate solution, 30min before surgery.

After shifting the patient to operating room, patients were monitored for heart rate (HR), non-invasive blood pressure (NIBP), percentage of oxygen saturation (Sp02). Under strict aseptic precautions, with patient in lateral or sitting position, subarachnoid block was performed with a 23GQuincke needle at the L3-L4 interspace. The study solution was administered over 10 seconds. Patient was repositioned gently to supine position without elevation of extremities and tested every 5 minutes until maximal spread of sensory blockade, and then every 15 minutes during the surgery. Group A: Patients received 3ml of 0.5% levoBupivacaine with 5µgdexmedetomidine. Group B: Patients received 3ml of 0.5% of Bupivacaine with 5 µg dexmedetomidine.

Loss of sensation was assessed by pin prick method using a hypodermic needle and patients were asked about the sensation.

Pain was evaluated with visual analogue scale (VAS). VAS consists of a ten cm line with one end as —NO PAIN and other end as —WORST PAIN IMAGINABLE. All patients were instructed to point out intensity of pain on the scale, 0- no pain, 10- worst pain. Rescue analgesia was given if VAS score >5.

The degree of motor block was assessed using "Bromage scale". Motor blockade was assessed at 5 minutes and then for every 30 seconds till grade IV block is achieved. And then every 15 minutes until return of normal motor function.

Hear rate (HR), blood pressure (BP), respiratory rate(RR), Spo2 monitored at 5,10,15,20,25,30,45,60,90,120 minutes intraoperative; 15 min, 30 min, 45 min, 60 min, 2hrs, 3 hrs, 6 hrs postoperatively. Patients were considered hypotensive when their mean arterial pressure (MAP) is decreased to <65 mmHg and were treated with Inj. Ephedrine 6 mg i.v. dose titrated according to response. Bradycardia (a decrease in the heart rate to < 60 beats per minute) was treated with Inj. Atropine 0.3- 0.6mgi.v.

STATISTICAL METHODS:

This is a prospective, randomized, controlled, double blind study, where the patients were selected randomly. The demographic data was analyzed using either Student's t-test or Chi-square test. Quantitative data was analyzed by student's t-test and qualitative data was analyzed by Chi- Square test. All values were expressed as mean ± standard deviation. P value of < 0.05 was considered statistically significant.

RESULTS:

TIME OF ONSET OF SENSORY BLOCKADE:

The mean time of onset of sensory blockade is significantly shorter in Group B [3.46±1.13min] compared to Group A [4.86±1.04 min] with a P Value of <0.001.

Table 1: Time of Onset of sensory blockade

	GROUP A	GROUP B	P Value
MEAN	4.86	3.46	<0.001
SD	1.04	1.13	

TIME TO REACH HIGHEST SENSORY LEVEL:

The time taken to reach highest sensory level is shorter with Group B i.e. Racemic Bupivacaine with dexmedetomidine Group [8.1±3.32min] compared to Group A Levobupivacaine with dexmedetomidine Group [12.5±4.5min] with a P Value of <0.001.

Table -2: Time to reach highest sensory level

	GROUP A	GROUP B	P Value
MEAN	12.5	8.1	<0.001
SD	4.5	3.32	

TIME TO REACH GRADE 4 MOTOR BLOCKADE:

Time taken to reach Grade 4 motor blockade is shorter with Group B i.e. Racemic Bupivacaine with dexmedetomidine Group [5.8±2.32 min] compared with Group A i.e. Levobupivacaine and dexmedetomidine Group [10 ± 4.5min] with a P value of <0.001.

Table -3: Time taken to reach grade 4 Motor Blockade

	GROUP A	GROUP B	P Value
MEAN	10	5.8	<0.001
SD	4.5	2.32	

There is no significant difference between both the groups in relation to rescue analgesia, mean arterial pressure, HR,RR,SPO2.

DISCUSSION:

Bupivacaine is a long duration local anaesthetic that has remained popular for regional anaesthesia for over three decades. Bupivacaine shows good Motor and sensory separation and does not have tachyphylaxis.It was assumed that the local anaesthetic toxicity manifest as a progression from mild symptoms to convulsions and eventually to cardiac depression and cardiac arrest. However disturbing reports of sudden cardiac arrest without any prodromal CNS symptoms, prolonged and difficult resuscitations have led many to re-evaluate the use of Bupivacaine.

During the exploration of Bupivacaine toxicity significance of chirality or stereo-chemistry became apparent. The most common way to refer chirality is based on the effect it has on rotation of the optical light*McLeod GA, Burke D et.al 2001*.Using cloned Human cardiac delayed rectifier potassium channels the effects of dextro-bupivacaine and Levo-Bupivacaine were assessed in a patch clamp technique(11). Apparent dissociation constants [Kd] values(8) of 27.3µ.M and 4.1µM were calculated for DextroBupivacaine and levobupivacaine, indicating dextrobupivacaine to be 7 times more potent than levobupivacaine in blocking potassium channels(8).

alpha-2 agonists clonidine was routinely used but the introduction of dexmedetomidine has further widened the scope. The faster onset of action of local anesthetics, rapid establishment of both sensory and motor blockade,prolonged duration of analgesia and stable cardiovascular parameters make these agents a very effective adjuvant in regional anesthesia.

The aim of this study is to compare the effects of 0.5% isobaric levobupivacaine with 0.5% hyperbaric racemic bupivacaine with dexmedetomidine as common adjuvant in subarachnoid block. The study design consisted of 60 patients aged between 20 – 60 yrs, ASA grade 1 and 2 undergoing elective lower abdominal, lower limb and urological procedure, divided into two groups.

In our study there are no significant differences in the Demographic profile of both the groups. The mean age, mean weight, mean height and gender ratio was similar in both the groups.

Onset of sensory Blockade:

Aliyeesmaglu, Sumeyraturk et al., in 2013,(9) had done a randomized controlled study comparing levobupivacaine(2.2±0.7 min) and addition of dexmedetomidine to intra-thecal levobupivacaine(1.1±0.3 min) and found that onset of sensory block was shorter in Group Levobupivacaine with dexmedetomidine than in Group Levobupivacaine (p< 0.001).

Al-Mustafa MM et al. in 2009(3)conducted a study on effect of dexmedetomidine added to spinal isobaric bupivacaine for urological procedures. The results of the study showed that the duration of onset of sensory blockade in Group bupivacaine with dexmedetomidine was 4.7±2.0 mins and Group bupivacaine was 18.0±3.3 mins. Our study concluded that the 0.5% isobaricLevobupivacaine with dexmedetomidine has slower onset of sensory blockade compared to 0.5% hyperbaric racemic bupivacaine with dexmedetomidine.

Time taken to attain highest sensory Level:

Aliyeesmaglu, Sumeyraturk et al., in 2013,(9) had done a randomized controlled study comparing levobupivacaine (13.4±5.8 min) and addition of dexmedetomidine to intra-thecal levobupivacaine (12.7±5 min) and found that time taken to attain the highest sensory level was shorter in Group Levobupivacaine with dexmedetomidine than in Group Levobupivacaine. Our study also concluded that the isobaric levobupivacaine with dexmedetomidine takes longer time to reach highest sensory level compared to hyperbaric racemic bupivacaine with dexmedetomidine.

Time taken to reach Grade 4 motor blockade:

Lee YY et al(4) have showed that time taken for complete motor block with levobupivacaine [4.30±1.58 min] was slightly longer in comparison to racemic Bupivacaine [3.40±1.07 min]. our study also concluded that the isobaric levobupivacaine with dexmedetomidine takes longer time for complete motor blockade in comparison to that of hyperbaric racemic Bupivacaine with dexmedetomidine.

CONCLUSION:

Although the onset of sensory, motor blockade and the time to reach highest sensory level is prolonged with isobaric Levobupivacaine with dexmedetomidine, its clinical significance is minimal.

Thus we conclude that 0.5% Isobaric Levobupivacaine with dexmedetomidine is a safer alternative to 0.5% hyperbaric racemic bupivacaine with dexmedetomidine for subarachnoid block.

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