e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(10); 768-771

Original Research Article

A Randomized Clinical Assessment of Pain Levels and Duration of Analgesia Using 0.5% Bupivacaine and 0.5% Ropivacaine for Lower Orthopaedic: a Comparative Study

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Received: 10-08-2023 / Revised: 16-09-2023 / Accepted: 22-10-2023
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Conflict of interest: Nil

Abstract

Aim: The aim of present study is to comparison of pain levels and duration of analgesia using 0.5% bupivacaine and 0.5% ropivacaine for lower orthopaedic surgeries.

Materials and Methods: The Present study was conducted in Department of Orthopaedics, Shri Krishna medical College and Hospital, Muzaffarpur, Bihar, India on ASA Grade I & II patients in the age group of 20-50 years scheduled to undergo elective lower limb orthopaedic surgeries. 100 patients of ASA Grade I & II were included in the study. All patients were shown Visual Analogue Score (VAS) and were appraised about the test pre operatively. Pain was assessed using 10 cm VAS (where 0 represents no pain and 10 being maximum imaginable pain). Under all aseptic precautions, a lumber epidural catheter was placed in L2 -L 3 interspace via Touhey's needle and syringe with loss of resistance technique. Onset of sensory blockade was noted in all the patients.

Results: The age of the patients varied from 20 -50 years in the both age groups .The youngest was 20 years and the eldest was the 50 years. The mean age of the patients in Group I was 35.125 ± 7.4 years and in the Group II was 34.2± 9.0 years. The duration of complete analgesia in Group I was 257 +/-15.5 mins and in Group II it was 289±22.5.There was a significant difference in the duration of complete analgesia between the two groups. . In Group I ,72 %patients described analgesia to be excellent(VAS 0 to 3) while in Group 80 % patients described analgesia to be excellent.

Conclusion: The duration of sensory blockade was longer than 0.75% Ropivacaine compared to 0.5% Bupivacaine when given via lumber epidural. This is evidenced by increased duration of complete and effective analgesia in range of 289±22.5 mins and 315±38.5 mins respectively for Ropivacaine 0.75% group.

Keywords: Bupivacaine, Pain, Ropivacaine, Sensory.

Introduction

Pain is the most common, complex and unpleasant experience one can go through in the perioperative period. Pain is as old as mankind. Infact pain is considered fifth vital sign along with pulse, blood pressure, temperature and respiration. Satisfactory pain relief is essential not only to reduce the morbidity and suffering of patient but also to keep morale of patient high throughout operative and post operative period. The base of anaesthesiology lies in prevention of pain sensation. Regional anaesthesia here is more advantageous in many ways like more preserved reflexes, minimal sedation, minimal pharmacological side effects, reduced intraoperative blood loss ,less postoperative nausea and vomiting , relatively preserved pulmonary functions, early ambulation, decreased hospital stay time ,cost effectiveness, better postoperative pain control. [1,2]

The recognition of acute life-threatening cardiotoxicity of bupivacaine lead to the search for a local anaesthetic agent comparable with bupivacaine but with lower cardiotoxicity resulting in development of a relatively new amide, ropivacaine. Ropivacaine is produced as pure 'S' enantiomer with lower lipid solubility, easier reversibility after inadvertent intravascular injection, significant reduction in central nervous system toxicity, lesser motor block and greater differentiation of sensory and motor block. [3,4,5] In equipotent concentrations the degree of motor blockade is less pronounced with ropivacaine, and there is a greater propensity for blocking pain transmitting A-delta and C fibres rather than A-α motor fibres. Ropivacaine has enormous potential as a local anaesthetic agent. [6,7] It appears to have most of the blocking characteristics of bupivacaine. These findings created interest to

study this new anaesthetic agent for block characteristics and safety profile and to compare this drug with commonly used drug bupivacaine and to know whether it can replace this older anaesthetic agent in future. So we have undertaken the study to compare ropivacaine 0.5% (20ml) and bupivacaine 0.5% (20ml) for epidural anaesthesia in patients undergoing lower limb orthopaedic surgeries.

Materials and Methods

The Present study was conducted in Department of Orthopaedics, Shri Krishna medical College and Hospital, Muzaffarpur, Bihar, India for two years on ASA Grade I & II patients in the age group of 20-50 years scheduled to undergo elective lower limb orthopaedic surgeries. 100 patients of ASA Grade I & II were included in the study.

Those with any contraindications to spinal anaesthesia or any other systemic illness were excluded from study. All patients underwent pre-anaesthetic check up where detailed history was taken, they were physically examined and relevant routine and special investigations were carried out. Informed and written consent for anaesthetic procedure was taken from patient for surgery.

All patients were shown Visual Analogue Score (VAS) and were appraised about the test pre operatively. Pain was assessed using 10 cm VAS (where 0 represents no pain and 10 being maximum imaginable pain). Under all aseptic precautions, a lumber epidural catheter was placed in L2 -L 3 interspace via Touhey's needle and syringe with loss of resistance technique. After successful placement of catheter, the drug was injected epidurally while patient lying in supine position. All patients received oxygen @ 4 L/min via oxygen mask. Onset of sensory blockade was noted in all the patients.

Determination of onset of sensory block by done by touch and pin prick technique.

All the data was recorded in tabulated form and analyzed by SPSS software. Chi square test was used for analysis. P value of greater than 0.05 was considered significant.

Results

This study was carried out in 100 patients of patients of ASA grade I &II who underwent selective lower limb orthopaedic surgeries. The age of the patients varied from 20 -50 years in the both age groups .The youngest was 20 years and the eldest was the 50 years. The mean age of the patients in Group I was 35.125 ± 7.4 years and in the Group II was 34.2± 9.0 years.

Table 1 shows the mean duration of surgery in both the groups. It is evident from the table that mean duration of surgery was 86.5±23 mins in Group I while in Group II it was 82.0± 26 mins (p> 0.05). So we can conclude that the duration of surgery was comparable in both groups.

Table 2 shows the mean duration of complete analgesia and effective analgesia in groups. The duration of complete analgesia in Group I was 257 +/-15.5 mins and in Group II it was 289±22.5.There was a significant difference in the duration of complete analgesia between the two groups. The duration of effective analgesia in Group I was 296.2±25 mins and in Group II was 315±38.5. The p value came out to be 0.04 i.e. there was a significant difference in effective analgesia time.

Table 3 shows the mean pain levels which was estimated using visual analogue scale. In Group I ,72 %patients described analgesia to be excellent(VAS 0 to 3) while in Group II 80 % patients described analgesia to be excellent .Mean VAS score or group I was 1.74±0.03 ,while it was 1.48±0.06 for Group II.

Table 1: Showing the mean duration of surgery between the two Groups

Group	No. of Patients	Mean Duration of Surgery (Mins)
Group I	50	86.5±23
Group II	50	82.0± 26

Table 2: Duration of complete analgesia and effective analgesia

S No.	Duration of analgesia	Group I	Group II	p-value
1	Duration of complete analgesia(MINS)	257±15.5	289±22.5	0.0001
2	Duration of effective analgesia(MINS)	296.2±25	315±38.5	0.0461

Table 3: Showing mean pain levels using visual analogue scale

VAS score	Group I		Group II	
	No. of patients	Percentage%	No. of patients	Percentage%
0-3	30	60	32	64
4-6	25	40	18	36
7-10	0	0	0	0
Mean VAS score	1.74		1.48	
SD	0.03		0.06	
Minimum	0		0	
Maximum	10		10	

Discussion

In the present study, patients aged between 20 -50 years were taken of ASA grade I&II. Total 100 patients were taken each divided in to 2 groups of 50 each randomly selected. Katz JA, Knarr D, Bridenbaugh PO et al [8] conducted their study on patients aged 18 -70 years (n=21 patients in each group) for Ropivacaine 0.75% and Bupivacaine 0.5% via epidural for lower limb surgeries.

Brown et al [9] conducted study on adult patients (n=22) with Bupivacaine 0.5%. Wolff et al5 conducted their study on adult patients with Ropivacaine 0.75%(n=29 patients) and Bupivacaine 0.5% (n=28 patients).

Recommended doses for Ropivacaine 0.75% is 15 – 25 ml for adults for lumber epidural for orthopaedic surgeries. In our current study, patients were administered 20 ml of Ropivacaine 0.75% (150 mg) and 20 ml of Bupivacaine 0.5% via lumber epidural for each group as optimal drug dose. Brown et al [9] used 20 ml of Bupivacaine 0.5% via lumber epidural for lower limb orthopaedic surgeries. Katz JA ,KnarrD, Bridenbaugh PO et al3 used 20 ml of Ropivacaine 0.75% and 20 ml of Bupivacaine 0.5% .Wolff et al (1995)conducted their study using 20 ml of 0.75% Ropivacaine & 0.5% Bupivacaine.

The onset of sensory block took (mean± S.D.) 20.6 ± 4.2 mins for Ropivacaine 0.75% & 20.8± 5.28 mins for Bupivacaine 0.5% group in our current study. There was clinically no difference in onset of sensory block. In study conducted by Kartz JA ,Knarr D et al3, time for onset of sensory block up to T12 was 9.0 ± 10 min and time for onset of maximum level of block was 28± 13 min for Ropivacaine 0.75% (20 ml) group while it was 6 ± 4min and 28± 12 min respectively for Bupivacaine 0.5% group(20ml). Brown et al [9] concluded that onset time for Bupivacaine 0.5% (20 ml) was 13 ± 10.7 min[mean ± SD]. In the study of Wolff et al [10], duration of onset of anaesthesia was <30 mins in most of the cases of the both the groups. In study conducted by Mc Glade DP, Kalpokas et al [11], for Bupivacaine 0.5% [20 ml],the onset of sensory block up to T 10 was 10 mins with the range of 8 – 15 mins. In study of Peduto et al [12] the mean duration of onset of sensory block for Ropivacaine 0.75% group was 25 mins and was 29 mins for Levobupivacaine 0.5% group. In the study conducted by Nedim Mustaffa et al [13] the mean onset of sensory block was 16.7 mins for Ropivacaine 0.75% group while 19.2 mins for Bupivacaine 0.5% group. Thus all the above study have concluded in general that that duration of sensory block either in Ropivacaine 0.75% group or Bupivacaine 0.5% group is less than 30 mins and in most of the studies it was near about 15 -25 mins which is supported by the results of our current study also.

In our current clinical study ,the duration of complete analgesia was 257±15.5 mins for Bupivacaine 0.5% group and 289±22.5 mins for Ropivacaine 0.75% group while the duration of effective analgesia was 296.2±25 mins for Bupivacaine 0.5% group and 315±38 mins for Ropivacaine. Duration of complete analgesia was taken as the time till patient did not experienced any pain at all and the duration of effective analgesia was taken as the duration till the patient had to be given first rescue analgesia on demand for pain. Pain was defined by the VAS score (0=no pain, 10= maximum imaginable pain).

There was significant difference between duration of complete analgesia and effective analgesia between both the groups ($p<0.05$) which shows that Ropivacaine 0.75% in equivolume doses provided significantly longer duration of analgesia compared to Bupivacaine 0.5% group. According to 25 multicentric clinical studies conducted over 942 patients, when Ropivacaine was administered in doses ranging from 100-200 mg, the mean duration of anaesthesia at T10 dermatome level was 4 hours (range 3-5 hours). Various studies have shown that as the concentration of Ropivacaine (so also the dose) is increased from the 0.5% to 0.75%, the duration of block is increased without any significant increase in the side effects. [14]

Conclusion

The duration of sensory blockade was longer than 0.75% Ropivacaine compared to 0.5% Bupivacaine when given via lumber epidural. This is evidenced by increased duration of complete and effective analgesia in range of 289±22.5 mins and 315±38.5

mins respectively for Ropivacaine 0.75% group. Thus on the basis of our study, we advocate the use of 0.75% Ropivacaine via lumber epidural block for lower limb orthopaedic surgeries which provides prolonged analgesia.

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