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A COMPARATIVE STUDY OF 0.75%ROPIVACAINE AND 0.5% BUPIVACAINE FOR EPIDURAL ANAESTHESIA IN LOWER LIMB AND LOWER ABDOMINAL SURGERIES

[1]Bairi Mounika, [2] S.J.V. Kameswararao, [3]P.Abbaiah, [4] P.Sreedevi

[1]Consultant Anesthetist: Om Sai Ram multi-speciality hospital, Jagityal, Telangana.

[2]Associate professor Department of Emergency Medicine: Kamineni Academy of Medical Sciences and Research Centre LB. Nagar Hyderabad, Telangana.

[3]Assistant Professor Department of Anaesthesiology, Gandhi medical college/Gandhi Hospital, Secunderabad, Telangana.

[4]Professor, Department of Anaesthesiology , Gandhi medical college Gandhi Hospital, Secunderabad, Telangana.

***Corresponding Author**

Dr. P. Sreedevi

Professor,

Department of Anaesthesiology

Gandhi medical college

Secunderabad

doctorsreedevi@gmail.com

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ABSTRACT

Aim: To compare 20 ml of 0.75% Ropivacaine (isobaric) and 20 ml 0.5% Bupivacaine (isobaric) for epidural anaesthesia in lower abdominal and lower limb surgeries.

Materials and methods: This study was conducted on 60 patients. The study subjects were aged between 18-60 years, belonging to ASA I and II and were undergoing elective lower abdominal and lower limb surgeries. Study group R- received 20ml of 0.75% Ropivacaine (isobaric) by epidural route.

Study group B- received 20ml of 0.5% Bupivacaine (isobaric) by epidural route.

Results: There was no statistically significant difference between the groups with respect to the time and onset of sensory and motor block ($p>0.05$).There was no difference in the highest level of sensory block achieved in both groups. The degree of motor blockade assessed by modified Bromage scale was similar in both groups (grade-3). The mean duration of motor block in Ropivacaine group was 243.6 ± 21.6 minutes, whereas in Bupivacaine group it was 285.3 ± 21.3 minutes. This difference was statistically significant ($p < 0.001$) indicating faster recovery from motor blockade in Ropivacaine group. The mean duration of sensory analgesia in Ropivacaine group was 387.4 ± 15.4 minutes. In Bupivacaine group the mean duration was 390.3 ± 14.2 minutes. The difference between the two groups was not significant. The changes in heart rate, blood pressure and respiratory rate at any time interval between the two groups were statistically not significant. Both Ropivacaine and Bupivacaine groups did not exhibit significant side effects.

Conclusion:

Keywords:

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INTRODUCTION

Regional anaesthesia is well known for its simplicity, effectiveness and safety. Anaesthesia that gives an efficient block, which has least onset of time and that can be prolonged with least complications is one of the main challenges faced by the anaesthesiologists. Though spinal anaesthesia provides an efficient block, it has some disadvantages such as height of block cannot be controlled, duration of block is constant and cannot be prolonged and it is associated with complications such as postdural puncture headache, neurological sequelae etc.

Epidural anaesthesia is one of the regional techniques for lower abdominal, lower limb, pelvic and vascular surgeries where complications are very less compared to spinal anaesthesia. Also, there is no limitation for the duration of surgery if an epidural catheter is in place. It can also be used as a modality for post-operative pain relief.[1] Regional anaesthesia is becoming one of the most useful and versatile procedures in modern anaesthesiology. Bupivacaine is a long acting amide local anaesthetic which is widely used since years, but it is associated with many side effects like Central Nervous System (CNS) toxicity and cardiotoxicity. Ropivacaine is a newly introduced long acting amide local anaesthetic drug in India which has been developed as a possible alternative to Bupivacaine. It has a lower lipophilicity than bupivacaine and hence associated with a decreased potential for CNS and cardiotoxicity.[2]

Bupivacaine, a highly lipophilic long-acting local anaesthetic has been the most commonly used anaesthetic agent in its class till date. Unfortunately, like all amide- type anaesthetics, Bupivacaine has been associated with high degree of cardiac and local toxicity. An important aspect of this toxicity is that it involves stereo specificity, with the S(-) enantiomer showing significantly less cardio depressant effects than the R(+) enantiomer.[2]

Ropivacaine is a pure (S)-enantiomer while they are racemic mixtures. Ropivacaine has similar pharmacodynamic and pharmacokinetic profiles resembling to that of bupivacaine. The onset and duration of sensory block and the overall clinical efficacy of anaesthesia have been reported to be comparable to those seen with bupivacaine. However, the degree of motor block may be less with ropivacaine than bupivacaine when used in equal concentrations. Most importantly, ropivacaine is a pure S (−) enantiomer of bupivacaine and thereby less toxic to the cardiovascular and central nervous systems (CNS). Ropivacaine is easily available in two strengths, i.e., 0.5% and 0.75% for use in epidural anaesthesia.[3]

Lower abdominal and lower limb surgeries may be performed under local, regional (spinal or epidural) or general anaesthesia, but neuraxial blockade is preferred mode of anaesthesia. Major advantage of epidural anaesthesia over spinal anaesthesia is the ability to titrate the extent and duration of anaesthesia.[4] Hence this study is undertaken to compare the effectiveness of epidural Ropivacaine with epidural Bupivacaine for anaesthesia in lower abdominal and lower limb surgeries.

MATERIALS AND METHODS

This Comparative Cross Sectional Study was conducted on patients undergoing elective lower limb and lower abdominal surgeries done for a period of one year. The details of

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various methods followed, and materials used while conducting the study are described below.

Study Population: 60 Patients coming to Gandhi Hospital posted for elective lower limb and lower abdominal surgeries

Inclusion Criteria: Patients between the age groups of 18 and 60 years of age, ASA grade I and II **,** Patients undergoing elective lower limb and lower abdominal surgeries under regional anaesthesia .

Exclusion Criteria: Allergy to any of the drugs, Infection at the site of injection, Patients on anticoagulation, Congenital abnormalities of lower spine and meninges. o Active disease of CNS

Methodology:

After institutional ethical committee approval and written informed consent, 60 patients aged between 18 to 60 years who are undergoing elective lower limb and lower abdominal surgeries were selected. Among the selected individuals, those fulfilling the inclusion criteria were included in the study.

Study participants were divided into two groups having 30 patients each, and administered the following:

- Group R patients received 20ml of 0.75% isobaric Ropivacaine through epidural route.
- Group B patients received 20ml of 0.5% isobaric Bupivacaine through epidural route

Standard monitoring, including electrocardiogram, non-invasive blood pressure, oxygen saturation and will be used throughout the surgery.

Patients were evaluated and compared for onset of sensory and motor block, Highest level of sensory block, Degree of motor blockade, Duration of motor blockade, Duration of sensory analgesia, Haemodynamic changes and complications of both groups. Clinical assessment with detailed history was taken a day before the scheduled surgery in a routine pre-anaesthetic check-up. along with this pre-operatively baseline investigations were performed:

Premedication: Tab. Diazepam 10 mg orally was given the previous night. Patients were kept nil orally for 6-8 hours before surgery.

Injection ranitidine 50 mg IV was given before insertion of epidural catheter. Procedure:

Drugs and all equipment required for resuscitation and general anaesthesia were kept ready. Epidural tray was autoclaved. IV line was secured using an 18G cannula and the patient was preloaded with 500 ml Ringers lactate solution. Base line heart rate, blood pressure, and respiratory rate were recorded.

The patient was placed in left lateral or sitting position. Under aseptic precautions a skin wheal was raised with 2ml of 2% Lignocaine in L3-L4 interspace. An 18 G Touhy needle was passed for about 1cm through that space. A 10ml dry glass syringe with an air column of 5ml was firmly attached to the hub of the Touhy needle after removing the stylet. The needle was slowly advanced until it entered the epidural space, that was identified by the loss of resistance to air. After confirming the epidural space, the glass syringe was disconnected. Absence of blood or CSF was confirmed. An 18G epidural catheter was passed along the epidural space in cephalad direction until 3cm is in the space. 3ml of 2% Lignocaine with adrenaline 1:200000 was given as test dose. This is to exclude the presence of needle in epidural vein or subarachnoid space. 4 minutes later, 20 ml of the study drug was injected

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through the epidural catheter intermittently over 3 minutes.
All the patients were monitored for any side effects and cardio respiratory problems, if any and supplemental oxygen were given. Fluid management was done according to requirements including fluid deficit, maintenance, blood loss etc.
The following parameters were observed and recorded:
Onset of sensory block: Pin-prick method using a 27-gauge hypodermic needle was used to test the onset of sensory. The time of onset was taken from the time of injection of drug into epidural space to loss of pin prick sensation.
Onset of motor block: The time interval between administration of drug into epidural space and the patient's inability to lift the straight extended leg (Modified Bromage scale 1) was recorded as onset time for motor block.
Highest level of sensory block: The highest level of sensory blockade was assessed by pin prick method by using a hypodermic needle. The highest dermatomal level blocked was recorded after the onset of motor block.
Degree of motor block: Modified Bromage scale was used to assess the degree of motor block. Modified Bromage scale:[1]
Duration of motor block: The duration of motor block was calculated from time of injection to complete regression of motor block. (Modified Bromage scale – 0, Ability to lift the extended leg i.e.).
Duration of sensory analgesia: Duration of sensory analgesia was recorded from the onset of sensory block to complete return of sensation to pin prick.
Haemodynamic changes: All the patients were monitored for heart rate, blood pressure and respiratory rate at 0, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120 and 180 minutes after the administration of epidural block.
Side effects were observed for, recorded and treated accordingly

Statistical analysis:

Arithmetic mean = Sum of all the values =ΣX No.of values n Standard deviation, Student's unpaired t test :t = Difference of means, S.E of difference of means

RESULTS

The study sample comprised of 60 patients aged between 18 to 60 years belonging to ASA grade I and II, posted for elective lower abdominal and lower limb surgeries. Group R (30)- 20 ml of 0.75% Ropivacaine and Group B(30) received 20ml of 0.5% Bupivacaine.

Table-1: Demographic details in study

Age (Years)	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**	
	No.	%	No.	%
18-29	8	26.7	7	23.3
30-39	12	40	6	20
40-49	6	20	9	30
50-59	4	13.3	8	26.7
Total	30	100	30	100
Mean+/-SD	36.23+/-10.3		39.24+/-11.7	

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Gender				
Male	16	53.3	15	50
Female	14	46.7	15	50

Majority (40%) of the study participants in Group R belong to 30-39 years age group and in Group B 30% of the study participants were of the age group 40-49 years. In group R there were 16 males (53.3%) and 14 females (46.7%). In group B there were 15 males (50%) and 15 females (50%) . The percentage distribution of males and females in the two groups was similar. (p= 0.7961).

Table-2: Onset of Sensory Block and motor block in present study

Parameter	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**		**Mean Difference**	**P* Value, sig**
	Mean	**SD**	**Mean**	**SD**		
Onset of Sensory Block(min)	10.4	1.5	10.9	1.4	0.5	0.36
Onset of motor Block(min)	28.5	3.2	27.9	3.5	0.6	0.9767

The mean weight of the patients in Ropivacaine group (group R) was 52.8 ± 5.4 kgs and in Bupivacaine group (group B) it was 53.6 ± 5.6 kgs . The weight distributions between the two groups were not significant. (p= 0.097) The mean time for onset of sensory block in Ropivacaine group (group R)was 10.4 ± 1.5minutes and 10.9 ± 1.4 minutes in Bupivacaine group(group-B).

The onset of sensory block in group B was delayed by only few seconds than group R (p= 0.36), so the difference was not statistically significant.

The mean time for onset of motor block in Ropivacaine group (group R) was 28.5 ± 3.2 minutes and in Bupivacaine group (group B) it was 27.9 ± 3.5 minutes. There was no significant difference between the groups (p=0.976).

Table-3: Highest level of sensory block

Highest level of sensory block	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**	
	No.	%	No.	%
T6	17	56.7	17	56.7
T7	11	36.7	9	30
T8	0	0	1	3.3
T10	2	6.6	3	10

X^2 = 0.3837 p value =0.94 NS

In patients of Ropivacaine group (group R), 56.7% attained T6 level, 36.7% attained T7 level and 6.6% attained T10 levels. In Bupivacaine group (group B) also 56.7% attained T6 levels, followed by 30% attaining T7 level 3.3% attained T8 level and 10% attaining T10 level . This implied that there was no difference in the highest level of sensory block achieved in both groups. (p=0.94).

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Table-4: Degree of motor block

Degree of motor block	0.75% Ropivacaine (group R)		0.5% Bupivacaine (group B)	
	No.	%	No.	%
Grade 0	0	0	0	0
Grade 1	0	0	0	0
Grade 2	5	16.7	4	13.3
Grade 3	25	83.3	26	86.7

X^2 = 0.1307 p value=0.717 NS

The degree of motor block was tested by modified Bromage scale. On comparison it was found that, in Ropivacaine group (group R) there were 5 patients (16.7%) who had grade 2 block and 25 patients (83.3%) who had grade 3 block. In Bupivacaine group (group B), 4 patients (13.3%) had grade 2 block and 26 patients (86.7%) had grade 3 block. The percentage distribution of patients who had grade 2 and grade 3 block was similar in both the groups.

Table-5: Duration of motor and sensory block

Parameter	0.75% Ropivacaine (group R)		0.5% Bupivacaine (group B)		Mean Difference	P*Value, sig
	Mean	SD	Mean	SD		
Duration of Motor Block(min)	243.6	21.6	285.3	21.3	41.7	<0.001 HS
Duration of Sensory Analgesia(min)	387.4	15.4	390.3	14.2	2.9	0.8966

The mean duration of motor block in Ropivacaine group (group R) was 243.6 ± 21.6 minutes, whereas in Bupivacaine group (group B) it was 285.3 ± 21.3 minutes. The p value was <0.001, indicating that the difference was highly significant. This implied that the duration of motor blockade in Ropivacaine group R was significantly lower than the Bupivacaine group B.(p value <0.001)

The mean duration of sensory analgesia in Ropivacaine group (group R) was 387.4 ± 15.4 minutes. In Bupivacaine group (group B) the mean duration was 390.3± 14.2 minutes . The duration of sensory analgesia in group B was prolonged by only few minutes than group R (p= 0.8966), so the difference was not statistically significant.

Table-6: Pulse rate comparison

Pulse Rate	0.75% Ropivacain e (group R)		0.5% Bupivacain e (group B)		Mean Difference	P* Value	Sig
	Mean	SD	Mean	SD			
0 min	77.8	4.1	80.2	5.6	2.4	0.0632	NS
5 min	89.9	5.1	90.5	4.2	0.6	0.6308	NS
10 min	90.4	4.8	89.7	4.4	0.7	0.5583	NS
15 min	74.6	4.1	72.5	5.0	2.1	0.0805	NS
20 min	77.8	5.5	76.8	4.9	1	0.4601	NS

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25 min	76.0	4.0	75.6	5.1	0.4	0.7366	NS
30 min	90.1	3.6	91.6	6.0	1.5	0.2451	NS
45 min	76.7	1.9	76.1	5.2	0.6	0.5551	NS
60 min	74.5	5.9	73.4	5.2	1.1	0.4467	NS
90 min	77.6	1.9	78.3	2.5	0.7	0.2270	NS
120 min	75.3	1.7	75.6	2.5	0.3	0.5889	NS
180 min	77.5	3.3	78.5	2.3	1	0.1077	NS

The mean pulse rate was compared between the two groups at 0, 5, 10, 15,20,25, 30, 45, 60, 90, 120 and 180 minutes . There was no significant difference between the Ropivacaine and Bupivacaine group with respect to pulse rate when recorded at these time intervals.

Table-7: Systolic blood pressure comparison

SBP (mm/Hg)	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**		**Mean Difference**	**P* Value**	**Sig**
	Mean	SD	Mean	SD			
0 min	114.3	7.6	111.5	6.5	2.8	0.1306	NS
5 min	113.6	7.8	114.3	6.5	0.7	0.7071	NS
10 min	112.1	7.9	109.1	6.5	3	0.1137	NS
15 min	109.6	8.1	107.5	7.0	2.1	0.2871	NS
20 min	106.6	6.8	103.5	7..0	3.1	0.0872	NS
25 min	107.6	6.7	109.5	7.4	1.9	0.3015	NS
30 min	112.6	6.7	113.5	7.4	0.9	0.6233	NS
45 min	110.6	5.6	112.4	7.4	1.8	0.2925	NS
60 min	113.7	6.2	110.8	6.9	2.9	0.0922	NS
90 min	113.9	7.2	111.3	6.9	2.6	0.1926	NS
120 min	114.8	6.2	112.8	6.7	2	0.2350	NS
180 min	116.5	5.8	115.6	6.6	0.9	0.6642	NS

The mean systolic blood pressure changes over the time intervals between the Ropivacaine (group R) and Bupivacaine group (group B) was compared. It was found that the systolic blood pressure did not differ between the two groups.

Table-8: Diastolic blood pressure comparison

DBP(mm/Hg)	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**		**Mean Difference**	**P* Value**	**Sig**
	Mean	SD	Mean	SD			
0 min	76.5	5.8	74.3	6.6	0.47	0.1 755	NS
5 min	75.9	5.6	73.9	4.8	0.07	0.1 429	NS
10 min	70.2	5.3	68.9	5.5	0.67	0.3 551	NS
15 min	72.3	6.4	70.4	6.3	0.13	0.2 513	NS
20 min	62.7	4.2	64.6	4.3	0.13	0.0 887	NS
25 min	64.9	5.2	65.3	4.3	0.40	0.7 466	NS
30 min	68.7	4.5	68.8	4.7	0.53	0.9 332	NS

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45 min	69.2	6.5	69.5	6.2	0.60	0.8 555	NS
60 min	71.2	5.8	72.1	5.2	0.87	0.5 293	NS
90 min	71.3	6.2	72.7	5.9	0.73	0.3 435	NS
120 min	75.7	5.0	74.5	5.1	1.20	0.3 612	NS
180 min	72.1	5.1	70.1	5.2	0.73	0.1 380	NS

As with the systolic blood pressure, the mean diastolic blood pressure changes over the time intervals between Ropivacaine (group R) and Bupivacaine (group B) groups were similar. The difference was not statistically significant .

Table-9: Respiratory rate comparison

Respiratory rate	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**		**Mean Difference**	**P* Value**	**Sig**
	Mean	SD	Mean	SD			
0 min	14.8	1.4	14.5	1.3	0.3	0.39 33	NS
5 min	14.2	1.5	14.5	1.4	0.3	0.42 65	NS
10 min	15.2	1.4	15.4	1.4	0.2	0.58 22	NS
15 min	14.4	1.3	14.6	1.3	0.2	0.55 36	NS
20 min	15.1	0.9	15.2	1.1	0.1	0.70 14	NS
25 min	14.4	0.9	13.9	1.2	0.5	0.07 30	NS
30 min	14.5	1.2	14.6	1.3	0.1	0.75 80	NS
45 min	15.2	1.3	15.3	1.0	0.1	0.73 96	NS
60 min	15.1	1.2	14.8	1.4	0.3	0.37 65	NS
90 min	15.3	1.1	15.2	1.1	0.1	0.72 60	NS
120 min	14.8	0.9	14.4	0.8	0.4	0.07 40	NS
180 min	14.2	0.6	14.3	0.7	0.1	0.55 48	NS

The mean respiratory rate at 0, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120 and 180 minutes in Ropivacaine group was compared to that of Bupivacaine group. The difference was not statistically significant at any of the time intervals with respect to respiratory rate.

Table-10: Side effects

Side Effects	**0.75% Ropivacaine (group R)**		**0.5% Bupivacaine (group B)**		**P* Value, sig**
	No.	%	No.	%	
Nausea	1	3	2	7	NS
Vomiting	2	7	1	3	NS
Hypotension	2	7	2	7	NS

* Fisher, exact test

In Ropivacaine group (group R), 7% patients had hypotension, 3% had nausea and 7% had vomiting. In Bupivacaine group (group B), 7% patients had hypotension, 7% had nausea and 3% had vomiting. There was no significant difference between the two groups with regard to these side effects .

DISCUSSION

Majority of patients were in the age group between 18 to 60 years, with mean age of 36.23+/-10.3 years in Group R and 39.2+/-11.24 years in Group B. The mean sex distribution and the

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mean weight in both groups were also identical. These parameters were matched in both the groups to avoid changes in intraoperative and postoperative outcome of patients.

In our study, the mean time for onset of sensory block in Ropivacaine group was 10.4 ± 1.5 minutes and 10.9 ± 1.4 minutes in Bupivacaine group. There was no statistically significant difference with regard to onset of sensory block between the groups. The mean time for onset of motor block in Ropivacaine group was 28.5 ± 3.2 minutes and in Bupivacaine group it was 27.9 ± 3.5 minutes. There was no statistically significant difference with regard to onset of motor block between the groups. Study done by K. Sampath Kumar Reddy et.al showed that the time of onset and duration of sensory block was comparable for both the drugs.[5] R. S. Sachidanand et.al did a prospective randomised control study to compare between two groups- 20ml of 0.75% Ropivacaine (Isobaric) and 20ml 0.5% Bupivacaine (Isobaric) for epidural anaesthesia in lower abdominal and lower limb surgeries in adults aged 18 to 60 years. The onset of sensory and motor blocks, highest level of sensory block of Ropivacaine were similar to that of Bupivacaine.[1] In a study done by Shakti Singhal et.al did a study on 60 patients undergoing elective lower limb orthopaedic surgery where the onset of sensory blockage in Group I was 3.17 ± 1.29 min and 2.60 ± 1.19 min in Group II which was statistically not significant.[6]

In a study conducted by Brockway M S et al comparing 0.5%, 0.75% and 1% Ropivacaine with 0.5% and 0.75% Bupivacaine found no significant differences in the onset time of sensory or motor block which was similar to the present study.[7] In a double-blind study was: to investigate the dose-response relationship of increasing doses of ropivacaine on the quality of anaesthesia and the duration of both motor and sensory blockade, and to compare these results with an established local anaesthetic, bupivacaine done by Finucane B T et al found no clinical difference in the onset of sensory or motor block when comparing 0.5%, 0.75% and 1% Ropivacaine with 0.5% Bupivacaine for epidural anaesthesia in patients undergoing abdominal hysterectomy.[8]

In a study done by Katz et al in which 0.5% Bupivacaine with 0.75% Ropivacaine were epidurally administered among 44 healthy patients, aged 18-70 years, undergoing lower extremity orthopaedic procedures were studied in a randomized, double-blind manner. They found no difference in the onset of sensory or motor blockade similar to our results.[9]

In a study done by Wolff A.P et al, found no difference in onset of sensory or motor block when comparing 0.5%, 0.75%, 1.0% Ropivacaine or 0.5% Bupivacaine administered extradurally in patients undergoing elective hip surgery.[10]

In a randomized, double-blind study conducted by Brown DL et al to compare the clinical effectiveness of Ropivacaine and Bupivacaine in patients undergoing lower- extremity surgery. They also found no difference in onset of sensory or motor block.[11] The above findings were similar to the study. Thus, we can conclude that there is no variation in the onset of sensory or motor blockade between 0.75% Ropivacaine and 0.5% Bupivacaine when administered through epidural route.

Highest level of sensory block was assessed by pin prick method using a blunt needle after the onset of motor block. In our study, patients of Ropivacaine group attained the following

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level of sensory block: 56.7% attained T6 level, 36.7% attained T7 level and 6.6% attained T10 levels. In Bupivacaine group also 56.7% attained T6 levels, followed by 30% attaining T7 level and 3.3% at T8 level 10% attaining T10 level. This implied that the sensory block level achieved by both groups were similar.

In a study done by R. S. Sachidanand et.al to compare between two groups- 20ml of 0.75% Ropivacaine (Isobaric) and 20ml 0.5% Bupivacaine (Isobaric) for epidural anaesthesia in lower abdominal and lower limb surgeries in adults aged 18 to 60 years the highest level of sensory block, were similar in both groups[1]

In a study conducted by Brockway M S et al comparing 0.5%, 0.75% and 1% Ropivacaine with 0.5% and 0.75% Bupivacaine. They found the mean upper limit of sensory block to be T6.[9]

Katz et al conducted a double blind comparison study of 0.5% Bupivacaine with 0.75% Ropivacaine administered epidurally. They found the median sensory block height to be between T4 for Bupivacaine and T5 for Ropivacaine. The higher block compared to our study could be related to higher volume of the drug used in their study.[10] From the above studies we can conclude that the highest level of sensory block is similar between Ropivacaine and Bupivacaine which was similar to the present study.

The degree of motor block was tested by modified Bromage scale. In our study, the degree of motor block between the two groups were almost similar. There was no statistically significant difference between the two groups.

In a study done by R. S. Sachidanand et.al to compare between two groups- 20ml of 0.75% Ropivacaine (Isobaric) and 20ml 0.5% Bupivacaine (Isobaric) for epidural anaesthesia in lower abdominal and lower limb surgeries in adults aged 18 to 60 years the degree of motor block of ropivacaine were similar to that of Bupivacaine.[1]

Brockway M S et al did a study in which ropivacaine, a new long-acting amide type local anaesthetic, was compared with bupivacaine in a randomized double-blind study and found the degree of motor blockade assessed by modified Bromage scale to be grade 3 in both the Ropivacaine and Bupivacaine group. This finding was similar to the present study.[7]

In a study done by Finucane B T et al found that the degree of motor blockade assessed by modified Bromage scale to be grade 3 in both the Ropivacaine and Bupivacaine group. This finding was similar to our study.[8] Similar findings were found in studies done by Katz et aland Wolff A.P et al. They found the degree of motor blockade assessed by modified Bromage scale to be grade 3 in both the Ropivacaine and Bupivacaine group.[9,10]

Duration of motor blockade was assessed from the time of administration of the drug to complete motor recovery (Bromage scale- 0). In our study, the mean duration of motor block in Ropivacaine group was 243.6 ± 21.6 minutes, whereas in Bupivacaine group it was 285.3 ± 21.3 minutes. This difference was statistically significant ($p < 0.001$). Shakti Singhal et.al did a study on 60 patients who were divided into two groups (I and II) of 30 each. Group I received 3ml of isobaric ropivacaine 0.5% Group II received 3 ml of isobaric ropivacaine 0.75%. Duration of the motor blockade in Group I was 126 ± 14.53 min and 175 ± 30.60 min in Group II which was statistically significant.[6]

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In a study done by Brockway et al, where they compared 0.5 %, 0.75 % and 1 % Ropivacaine 15 ml with 0.5% and 0.75 % Bupivacaine 15 ml in 110 patients and found no significant difference in onset, spread or duration of sensory block when similar concentrations were compared. However, Ropivacaine produced a slower onset, shorter duration and less intense motor block than Bupivacaine.[7]

In a double-blinded study done by Wolff A.P et al among 126 patients undergoing elective hip surgery; they received 20 ml of 0.5%, 0.75%, 1.0% Ropivacaine or 0.5% Bupivacaine extradurally which was similar to our study, they found that return of motor function was earlier with Ropivacaine compared to Bupivacaine.[10] From the above studies we can conclude that the duration of motor block is shorter with Ropivacaine than Bupivacaine.

In our study, the mean duration of sensory analgesia in Ropivacaine group was 387.4± 15.4 minutes. In Bupivacaine group the mean duration was 390.3 ± 14.2 minutes, indicating that there was no significant difference in the duration of sensory analgesia among the two groups. Prospective Randomised control study done by K. Sampath Kumar Reddy et.al to compare between two groups- 20ml of 0.75% Ropivacaine (Isobaric) and 20ml 0.5% Bupivacaine (Isobaric) for epidural anaesthesia in lower abdominal and lower limb surgeries in adults aged 18 to 60 years revealed that the duration of sensory block was comparable for both the drugs.[5] Brockway M S et al did a study in which ropivacaine, a new long acting amide type local anaesthetic, was compared with bupivacaine in a randomized double-blind study and it was found that there was no significant difference in duration of sensory analgesia when comparing Ropivacaine with Bupivacaine which was similar to the present study.[7]

In a double-blind study done by Finucane B T et al to investigate the dose- response relationship of increasing doses of ropivacaine on the quality of anaesthesia and the duration of both motor and sensory blockade, and to compare these results with an established local anaesthetic, bupivacaine it was found that there was no significant difference in duration of sensory analgesia when comparing Ropivacaine with Bupivacaine.[8] From the above studies we can conclude that there was no significant difference in duration of sensory analgesia when comparing Ropivacaine with Bupivacaine.

In our study, the two groups did not differ significantly with respect to heart rate at any time interval. There were no episodes of bradycardia in either group. The changes in mean systolic blood pressure and diastolic blood pressure at any time interval were statistically and clinically insignificant. 2 patients in Ropivacaine group and Bupivacaine group experienced hypotension. Hypotension was corrected by small doses of Inj. mephentermine / ephedrine.

In the study done by K. Sampath Kumar Reddy et.al both the drugs were comparable with respect to hemodynamic changes.[5] In a study done by R. S. Sachidanand et.al the haemodynamic changes of Ropivacaine is also not significantly different from that of Bupivacaine.[1] In a double blinded study done by Finucane B T et al found that the cardiovascular changes with respect to heart rate and blood pressure were similar in both Bupivacaine and Ropivacaine group.[8]

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In the study conducted by Brockway M S et al, the systolic and diastolic blood pressures decreased by about 20% from the baseline values over the first 20 minutes, whereas the heart rate tended to increase over first 15 minutes and there after decrease to slightly less than the baseline which was similar to the present study. There was no significant difference between the two groups.[7] In a study done by Wolff A.P et al comparing extradural Ropivacaine and Bupivacaine in hip surgery showed that Systolic and diastolic arterial pressures decreased in all groups. Treatment with ephedrine or atropine was required more often in the 0.75 % Ropivacaine group and in the 1 % Ropivacaine group compared with the 0.5 % Ropivacaine group and the 0.5 % Bupivacaine group.[10] From the above studies it can be concluded that epidural administration of Ropivacaine produces similar changes in haemodynamic parameters as that of Bupivacaine. These findings are similar to the present study.

None of our patients experienced respiratory depression and the mean RR between both the groups was statistically not significant which was similar to study done by Brockway M S et al[9]. Study done by Finucane B T et al also showed similar results to the present study.[8] Similar results were found in studies done by Katz et al, Wolff A.P.[9,10]

In Ropivacaine group, 7% patients had hypotension, 3% had nausea and 7% had vomiting. In Bupivacaine group, 7% patients had hypotension, 7% had nausea and 3% had vomiting, indicating no significant difference between the two groups with regard to these side effects. In a study done by R. S. Sachidanand et.al the side effect profile of Ropivacaine is also not significantly different from that of Bupivacaine.[1]Shakti Singhal et.al did a study on 60 patients who were divided into two groups (I and II) of 30 each. Group I received 3ml of isobaric ropivacaine 0.5% Group II received 3 ml of isobaric ropivacaine 0.75%. There were no significant differences in the adverse effects of both drugs.[15] Brockway M S et al, found similar number of side effects in each group, the commonest being backache (23%) followed by nausea (14%) and vomiting(2%).[9] The adverse events reported in the study conducted by Finucane B T et al were nausea, vomiting, hypotension, headache and backache.[8] The side effects reported in the above studies were similar in both groups as it was noticed in the present study.

CONCLUSION

The present study was clinical comparative study of 0.75% ropivacaine and 0.5% bupivacaine for epidural anaesthesia in lower abdominal & lower limb surgeries. We conclude that isobaric 0.75% Ropivacaine, when administered through epidural route, provides adequate anaesthesia for lower abdominal and lower limb surgeries. 0.75% Ropivacaine has a shorter duration of motor block when compared with 0.5% Bupivacaine. The onset of sensory and motor blocks, highest level of sensory block, degree of motor block and duration of sensory analgesia are similar to that of Bupivacaine. The haemodynamic changes and side effect profile of Ropivacaine is also not significantly different from that of Bupivacaine. Hence Ropivacaine can be used as a safe alternative to Bupivacaine for epidural anaesthesia in lower abdominal and lower limb surgeries. The shorter duration of motor

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block with Ropivacaine suggest that it could be effectively used for early mobilization of patients in the post-operative period.

REFERENCES

1. Sachidanand RS, Kumar GS, Rao BS, Devulapalli PK, Kanth L, Srinath M. A "comparative study between bupivacaine 0.5% and ropivacaine 0.75% in epidural analgesia in patients undergoing elective lower abdominal and lower limb surgeries" J Evol Med Dent Sci. 2015 Sep 28;4(78):13699–715.
2. Stienstra R. The place of ropivacaine in anesthesia. *Acta Anaesthesiol Belg.* 2003;54:141–8.
3. Comparison of Postoperative Pain After Epidural Anesthesia Using 0.5%, 0.75% Ropivacaine and 0.5% Bupivacaine in Patients Undergoing Lower Limb Surgery: A Double-Blind Study - PubMed [Internet]. [cited 2021 Nov 7]. Available from: https://pubmed.ncbi.nlm.nih.gov/28298756/
4. Kumar N, Sanjeev O, Kumar A, Kant S, Verma VK, Gupta AK. Comparison between epidural ropivacaine and ropivacaine–clonidine combination for infraumbilical surgeries: A randomized clinical study. Indian J Pain. 2019 May 1;33(2):81.
5. K. Sampath Kumar Reddy Comparison of ropivacaine (0.75%) and bupivacaine (0.5%) for epidural anaesthesia in patients posted for elective lower abdominal and extremity surgery - Google Search [Internet]. [cited 2021 Nov 7].
6. Singhal S, Agrawal G, Department of Pathology, Sanjay Gandhi Hospital, New Delhi. A comparative study of ropivacaine 0.5% versus ropivacaine 0.75% for spinal anesthesia in lower limb orthopedic surgery in ASA Grade – I/II adult patients: A prospective study. Asian Pac J Health Sci. 2018 Jun;5(2):65–75.
7. Concepcion M, Arthur GR, Steele SM, Bader AM, Covino BG. A new local anaesthetic, ropivacaine. Its epidural effects in humans. Anesth Analg. 1990 Jan;70(1):80–5.
8. Finucane BT, Sandler AN, McKenna J, Reid D, Milner AL, Friedlander M, et al. A double-blind comparison of ropivacaine 0.5%, 0.75%, 1.0% and bupivacaine 0.5%, injected epidurally, in patients undergoing abdominal hysterectomy. Can J Anaesth J Can Anesth. 1996 May;43(5 Pt 1):442–9.
9. Brockway MS, Bannister J, McClure JH, McKeown D, Wildsmith JA. Comparison of extradural ropivacaine and bupivacaine. Br J Anaesth. 1991 Jan;66(1):31–7.
10. Katz JA, Knarr D, Bridenbaugh PO. A double-blind comparison of 0.5% bupivacaine and 0.75% ropivacaine administered epidurally in humans. Reg Anesth. 1990 Oct;15(5):250–2.
11. Wolff AP, Hasselström L, Kerkkamp HE, Gielen MJ. Extradural ropivacaine and bupivacaine in hip surgery. Br J Anaesth. 1995 Apr;74(4):458–60.