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Original Research Article

An observational study comparing the effects of intraperitoneal ropivacaine and bupivacaine for postoperative pain relief in laparoscopic surgeries

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Abstract

Background & Methods: The aim of the study is comparing the effects of intraperitoneal ropivacaine and bupivacaine for postoperative pain relief in laparoscopic surgeries. 60 Patients were divided into two groups. In a sequential manner i.e. 1st patient will be allocated to group I, 2nd patient will be allocated to group II, 3rd patient will again be allocated to group I, so on and so forth till each group has 30 patients each.

Results: The mean duration of surgery in the ropivacaine group was 126.67 ± 43.89 minutes and in the bupivacaine group it was 107.63 ± 41.03 minutes. The difference was found to be statistically not significant (P<0.05), showing a comparable duration of surgery between the two groups.

The comparison of mean VAS between the two groups at different time intervals were assessed. In the ropivacaine group, the mean VAS at 1st hour was 1.70 ± 0.75. The mean VAS score showed a continuous increase till 12th hour and then a slight fall at the end of the study at 24th hour. In the bupivacaine group, the mean VAS at 1st hour was 0.67 ± 0.61. The mean VAS score showed a continuous increase till 8th hour then a fall at 12th hour, this fall continued till the end of the study at 24th hour. The difference of mean VAS between the two groups at different time intervals was calculated using unpaired t test. The mean VAS score was higher in the ropivacaine group at 1st hour, 2nd hour in comparison to the bupivacaine group (P<0.05), while it was comparable at 4th hour, 6th hour and 12th hour (P>0.05). At 8th hour the mean VAS in the ropivacaine group was significantly lower in comparison to the bupivacaine group (P<0.05), while at 24th hour the mean VAS in the ropivacaine group was significantly higher in comparison to the bupivacaine group (P<0.05).

Conclusion: Intraperitoneal instillation of Bupivacaine 0.25% (not exceeding 2 mg/kg), and Ropivacaine 0.2% 30 ml is an effective method of postoperative pain relief in laparoscopic surgeries. Both the drug significantly reduces postoperative pain. We found that instillation of local anesthetic agents intraperitoneally is easy and effective technique to attenuate postoperative pain provide profound analgesia for prolonged period thus requiring less rescue analgesia.

Keywords: effects, intraperitoneal, bupivacaine and ropivacaine, laparoscopic & abdominal surgeries.

Study Design: Prospective, randomised and comparative study.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

1. Introduction

After introduction of laparoscopic surgeries, surgical procedure have been improved to reduce trauma, morbidity, mortality, smaller and more cosmetic incision, less blood loss and reduce hospital stay[1]. Patients undergoing laparoscopic procedure do experience postoperative pain, especially in upper abdomen, shoulder and back regions. These can occur for various reasons: stretching of parietal peritoneum due to insufflations of gas intraperitoneally, release of inflammatory mediators of pain, irritation produced by blood, irritation of phrenic nerve by residual CO2. Pain intensity usually peaks during the first postoperative period[2].

The reason for marked variation of pain between individuals remains unclear but can be due to multiple factors including duration of surgery, the degree of invasiveness of the procedure, the experience of surgeon and the amount of intra operative bleeding. It can also be influenced by the size of the trocars, the use of suction to remove any blood and insufflated gas at the end of surgery[3].

Various methods have been tried for post-operative analgesia after laparoscopy like epidural analgesia, NSAID, instillation of local anesthetic solutions intraperitoneally[4]. Earlier studies have shown that intraperitoneal instillation of local anesthetics decreases incidence of post-operative shoulder pain in gynecological surgeries. This present study proposes to assess the efficacy of the same after laparoscopic surgeries. Bupivacaine has been utilized successfully for providing effective post-operative analgesia but its main drawback is its cardiotoxicity. Ropivacaine is less cardiotoxic, longer acting and can be administered in larger doses if required[5].

The study hence aims to assess the efficacy of intraperitoneal instillation of Bupivacaine and Ropivacaine and compare the pain relief after laparoscopic surgeries.

2. Material and Methods

All patients admitted in Choithram Hospital & Research Centre, Indore, and posted for elective laparoscopic abdominal surgeries under general anesthesia during the study period.

60 Patients were divided into two groups. In a sequential manner i.e. 1st patient will be allocated to group I, 2nd patient will be allocated to group II, 3rd patient will again be allocated to group I, so on and so forth till each group has 30 patients each.

1. Group B (Bupivacaine group): The patients allocated to this group will receive 30 ml of inj Bupivacaine intraperitoneally.
2. Group R (Ropivacaine group): The patients allocated to this group will receive 30 ml of inj ropivacaine intraperitoneally.

Intraperitoneal drug was instilled at the end of surgery and assessment was done in postoperative peeiod.

Inclusion criteria:

1. Patients of age more than 18 years and less than 65 years
2. Patients with ASA physical status I and II undergoing elective laparoscopic abdominal surgery.
3. Patients of either gender
4. Patients and/or his/her legally acceptable representative willing to provide their voluntary written informed consent for participation in the study

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Exclusion criteria:

1. Patient with age > 65 years
2. Patient with weight > 80 kg
3. Patient with anticipated difficult airway and emergency surgery
4. Patient with ASA III or IV Physical status
5. Patient with history of malignancy

3. Result

Table No. 1: Distribution of patients according to age

Age	Ropivacaine Group (n=30)		Bupivacaine Group (n=30)	
	No.	%	No.	%
29-30 years	2	6.7	1	3.3
31-40 years	4	13.3	6	20.0
41-50 years	10	33.3	10	33.3
51-60 years	13	43.3	7	23.3
>60 years	1	3.3	6	20.0
Total	30	100.0	30	100.0
Mean ± SD	48.80 ± 9.09		49.33 ± 9.88	
't' value	-0.218, df=58			
P value	0.828, NS			

The above table shows the distribution of patients according to age in ropivacaine and bupivacaine groups. In the ropivacaine group, there were 2 (6.7%) patients in the age group 29-30 years, 4 (13.3%) patients in the age group 31-40 years, 10 (33.3%) patients in the age group 41-50 years, 13 (43.3%) patients in the age group 51-60 years and 1 (3.3%) patient in the age group >60 years. In the bupivacaine group, there was 1 (3.3%) patient in the age group 29-30 years, 6 (20.0%) patients in the age group 31-40 years, 10 (33.3%) patients in the age group 41-50.

Table No. 2: Distribution of patients according to sex

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Sex	Ropivacaine Group (n=30)		Bupivacaine Group (n=30)	
	No.	%	No.	%
Female	19	63.3	19	63.3
Male	11	36.7	11	36.7
Total	30	100.0	30	100.0

The above table shows the distribution of patients according to sex in ropivacaine and bupivacaine groups. In both the groups there were 19 (63.3%) females and 11 (36.7%) males, showing a female preponderance in both the groups.

Table No. 3: Distribution of patients according to type of surgery

Type of Surgery	Ropivacaine Group (n=30)		Bupivacaine Group (n=30)	
	No.	%	No.	%
Cholecystectomy	16	53.3	18	60.0
Total laparoscopic hysterectomy	14	46.7	12	40.0
Total	30	100.0	30	100.0

The above table shows the distribution of patients according to type of surgery in ropivacaine and bupivacaine groups. In the ropivacaine group, 16 (53.3%) patients underwent cholecystectomy and 14 (46.7%) patients underwent total laparoscopic hysterectomy. In the bupivacaine group, 18 (60.0%) patients underwent cholecystectomy and 12 (40.0%) patients underwent total laparoscopic hysterectomy. There is nearly equal distribution of patients undergoing a type of surgery.

Table No. 4: Comparison of mean duration of surgery between the two groups

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Duration of Surgery	Ropivacaine Group (n=30)	Bupivacaine Group (n=30)
Mean ± SD	126.67 ± 43.89	107.63 ± 41.03
't' value	1.735, df=58	
P value	0.088, NS	

Unpaired t test applied. P value < 0.05 was taken as statistically significant.The above table shows the comparison of mean duration of surgery between the two groups.
The mean duration of surgery in the ropivacaine group was 126.67 ± 43.89 minutes and in the bupivacaine group it was 107.63 ± 41.03 minutes. The difference was found to be statistically not significant (P<0.05), showing a comparable duration of surgery between
the two groups.

Table No. 5: Comparison of mean Pulse Rate between the Ropivacaine and Bupivacaine groups at different time intervals

Time Interval	Ropivacaine Group (n=30)	Bupivacaine Group (n=30)	't' value	P value
Preop	79.83 ± 14.22	79.6 ± 14.18	0.064, df=58	0.949, NS
1st hour	77.73 ± 9.9	76.2 ± 10.06	0.595, df=58	0.554, NS
2nd hour	77.3 ± 8.55	75.2 ± 9.76	0.886, df=58	0.379, NS
4th hour	77.1 ± 7.1	75.07 ± 8.04	1.039, df=58	0.303, NS
6th hour	77.03 ± 7.49	75.4 ± 7.67	0.835, df=58	0.407, NS
8th hour	77.6 ± 8.03	77.43 ± 7.76	0.082, df=58	0.935, NS
12th hour	79.6 ± 8.41	76.2 ± 7.64	1.639, df=58	0.107, NS
24th hour	78.7 ± 8.51	75.87 ± 8.79	1.269, df=58	0.210, NS

The above table shows the comparison of mean pulse rate between the two groups at different time intervals. In the ropivacaine group, the mean pulse rate at the baseline was 79.83 ± 14.22 bpm. In the bupivacaine group, the mean pulse rate at the baseline was 79.6 ± 14.18 bpm.The difference of pulse rate between the two groups at different time intervals was calculated using unpaired t test.There was statistically no significant difference in mean pulse rate seen between the two groups at any of the time intervals (P>0.05), showing the mean pulse rate was comparable between the two groups at all the time intervals.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Table No. 6: Comparison of mean MAP between the Ropivacaine and Bupivacaine groups at different time intervals

Time Interval	Ropivacaine Group (n=30)	Bupivacaine Group (n=30)	't' value	P value
Preop	87.76 ± 9.13	87.18 ± 9.4	0.242, df=58	0.810, NS
1st hour	85.54 ± 7.35	84.42 ± 6.16	0.641, df=58	0.524, NS
2nd hour	88.39 ± 6.84	88.22 ± 4.67	0.11, df=58	0.913, NS
4th hour	91.02 ± 6.77	91 ± 4.81	0.015, df=58	0.988, NS
6th hour	93.03 ± 7.39	92.96 ± 4.46	0.049, df=58	0.961, NS
8th hour	94.42 ± 6.87	95.83 ± 4.51	-0.94, df=58	0.351, NS
12th hour	98.47 ± 6.62	98.33 ± 5.04	0.088, df=58	0.930, NS
24th hour	100.29 ± 6.42	99.02 ± 4.33	0.896, df=58	0.374, NS

The above table shows the comparison of mean MAP between the two groups at different time intervals. In the ropivacaine group, the mean MAP at the baseline was 87.76 ± 9.13 mm Hg. In the bupivacaine group, the mean MAP at the baseline was 87.18 ± 9.4 mm Hg. The difference of mean MAP between the two groups at different time intervals was calculated using unpaired t test. There was statistically no significant difference in mean MAP seen between the two groups at any of the time intervals (P>0.05), showing the mean MAP was comparable between the two groups at all the time intervals.

Table No. 7: Comparison of mean VAS between the Ropivacaine and Bupivacaine groups at different time intervals

Time Interval	Ropivacaine Group (n=30)	Bupivacaine Group (n=30)	't' value	P value
Preop	-	-	-	-
1st hour	1.70 ± 0.75	0.67 ± 0.61	5.869, df=58	0.000*
2nd hour	2.03 ± 0.61	1.40 ± 0.49	4.383, df=58	0.000*
4th hour	2.60 ± 0.49	2.50 ± 0.78	0.593, df=58	0.555, NS
6th hour	2.90 ± 0.40	3.10 ± 1.03	-0.991, df=58	0.326, NS
8th hour	3.07 ± 0.45	4.17 ± 1.21	-4.681, df=58	0.000*
12th hour	3.77 ± 0.68	3.47 ± 0.82	1.544, df=58	0.128, NS
24th hour	3.30 ± 0.84	2.80 ± 0.81	2.359, df=58	0.022*

The above table shows the comparison of mean VAS between the two groups at different time intervals. In the ropivacaine group, the mean VAS at 1st hour was 1.70 ± 0.75. The mean VAS score showed a continuous increase till 12th hour and then a slight fall at the end of the

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study at 24th hour. In the bupivacaine group, the mean VAS at 1st hour was 0.67 ± 0.61. The mean VAS score showed a continuous increase till 8th hour then a fall at 12th hour, this fall continued till the end of the study at 24th hour. The difference of mean VAS between the two groups at different time intervals was calculated using unpaired t test.The mean VAS score was higher in the ropivacaine group at 1st hour, 2nd hour in comparison to the bupivacaine group (P<0.05), while it was comparable at 4th hour, 6thhour and 12th hour (P>0.05). At 8th hour the mean VAS in the ropivacaine group was significantly lower in comparison to the bupivacaine group (P<0.05), while at 24th hour the mean VAS in the ropivacaine group was significantly higher in comparison to the bupivacaine group (P<0.05).

4. Discussion

Both the groups there were 19 (63.3%) females and 11 (36.7%) males, showing a female preponderance in both the groups. Ropivacaine group, 16 (53.3%) patients underwent cholecystectomy and 14 (46.7%) patients underwent total laparoscopic hysterectomy. In the bupivacaine group, 18 (60.0%) patients underwent cholecystectomy and 12 (40.0%) patients underwent total laparoscopic hysterectomy. There is nearly equal distribution of patients undergoing a type of surgery[6].

Mean duration of surgery in the ropivacaine group was 126.67 ± 43.89 minutes and in the bupivacaine group it was 107.63 ± 41.03 minutes. The difference was found to be statistically not significant (P<0.05), showing a comparable duration of surgery between the two groups.

It was observed that Ropivacaine had prolonged pain relief till 12 hrs postoperatively. In first four hours the mean VAS score of Ropivacaine was higher side(1.77±0.77 to 3.27 ± 1.08) compared to Bupivacaine (0.67±0.61 to 2.5 ±0.78) showed that Bupivacaine has more profound analgesic effect since the first hour as compare to Ropivacaine which may be due to the fact that Bupivacaine is more potent as compare to Ropivacaine.

Babu et al (2013)[7] found the similar findings.They used 20 ml of same drugs intraperitoneally only. No surgical wound infiltration done in their study and they found intraperitoneal instillation of both Ropivacaine 0.2% 20 ml and Bupivacaine 0.25% are equally effective in postoperative pain relief.

Acharya et al (2016)[8] used 38 ml of 0.2% ropivacaine with or without dexmedetomidine intraperitonally in laparoscopic hysterectomy and found combination of dexmedetomidine and ropivacaine superior in antinociceptive effects.

Pondove et al (2017)[9] used 20 ml of 0.25%bupivacaine in laparoscopic cholecystectomy and found significant analgesia in Bupivacaine group.

5. Conclusion

Sixty patients undergoing elective laparoscopic surgeries were randomly allocated in two group I and II. In the study total volume of administered drug was made constant i.e., 30 ml to avoid bias due to volume variance. All patient in group I (n-30) received 0.25% Bupivacaine 30 ml and group II (n-30) received 0.2% Ropivacaine 30 ml.

Intraperitoneal instillation of bupivacaine 0.25% (not exceeding 2 mg/kg), and Ropivacaine 0.2% 30 ml is an effective method of postoperative pain relief in laparoscopic surgeries. Both the drug significantly reduces postoperative pain. We found that instillation of local anesthetic agents intraperitoneally is easy and effective technique to attenuate postoperative pain provide profound analgesia for prolonged period thus requiring less rescue

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analgesia.Ropivacaine in view of better cardiovascular safety profile can be an effective alternative for Bupivacaine with similar postoperative pain relief.

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