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A COMPARATIVE STUDY OF INTRAPERITONEAL INSTILLATION OF NORMAL SALINE, ROPIVACAINE AND BUPIVACAINE IN GALL BLADDER FOSSA FOR POSTOPERATIVE PAIN MANAGEMENT AFTER LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

INTRODUCTION: Intraperitoneal instillation of local anesthetics minimizes postoperative pain after laparoscopic surgeries.

AIM: To evaluate the use of intraperitoneal ropivacaine and bupivacaine in Laparoscopic Cholecystectomy patients as effective and safe modality for post-operative analgesia.

MATERIALS AND METHODS: After taking written informed consent,90 patients undergoing laparoscopic cholecystectomy were randomized among three groups of 30 patients each. In Group A, patients were given 0.9% of normal saline as placebo, in group B, patients were instilled with 20 ml of ropivacaine (0.75%) and in group C, patients were instilled with 20 ml of bupivacaine (0.50%) in gall bladder fossa after the removal of gall bladder. Patients were then assessed for post-operative pain after Laparoscopic Cholecystectomy.

RESULTS: Demographic profile was comparable in the three groups. The mean intensity of post-operative pain assessed by visual analog scoring scale was statistically significant in normal saline group as compared to ropivacaine group at 0 hours (p=0.000), at 4 hours (p=0.001) at 8 hours (p=0.000) and at 12 hours (p=0.029) and while comparing with bupivacaine it was statistically significant at 0 hours (p=0.000), at 4 hours (p=0.017) and at 8 hours (p=0.010). While as pain intensity in bupivacaine group was more but statistically non-significant than ropivacaine group at all time intervals.

CONCLUSION: Both bupivacaine 0.50% and ropivacaine 0.75% instilled in the gall bladder fossa are effective for post-operative analgesia upto 12 hours.

KEYWORDS: intraperitoneal instillation, postoperative pain, ropivacaine, bupivacaine

INTRODUCTION

Gall bladder diseases are known to the mankind for over 2000 years.[1] The most common operation of the biliary tract performed these days is Cholecystectomy.[2] Laparoscopic Cholecystectomy is defined as any case in which entire cholecystectomy procedure is intended to

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be performed through laparoscope.[3] Advantages of Laparoscopic Cholecystectomy over open cholecystectomy include reduced pain, shorter hospital stay and recovery period, which affects the patient's earlier return to normal life and working activities.[4,5] In many centers patients are discharged on the first postoperative day. However, as experience expands further, few centers have recently shown that the operation is safe and feasible even as a day care procedure in properly selected patients.[6] From patient's perspective reduced postoperative pain is one of the greatest advantages of laparoscopic surgery compared with open surgery.

Postoperative pain is unpredictable, which explains the need for systematic prevention of pain before the patient wakes up from anaesthesia.[7] Pain following Laparoscopic Cholecystectomy is multifactorial and is differentiated into three components: visceral, abdominal wall and referred pain to shoulder. Different modalities have been proposed to relieve postoperative pain after laparoscopy like non-steroidal anti-inflammatory drugs, opioids, intraperitoneal local anesthetics, port site infiltration of local anesthetics, intraperitoneal saline, removal of insufflation gas or gas drains, low pressure abdominal insufflations, acetazolamide administration, use of nitrous oxide instead of carbon dioxide.

Local anesthetics are widely used, have a good safety profile and are available in long-acting preparations. They provide the benefit of anesthesia without the systemic side effects. Local anesthetics block the generation and propagation of action potentials in nerve and other excitable tissues in a reversible manner, probably at the level of the passive sodium channels.[8] Recently, the intra-operative use of local anesthesia during laparoscopy has generated interest.

Instillation of intraperitoneal lignocaine, bupivacaine, levobupivacaine and ropivacaine has been used following laparoscopic gynaecological and general surgical procedures to reduce postoperative pain through randomized trials for many years. [9-16] Although a number of these studies have reported a significant reduction in postoperative pain after the use of intraperitoneal local anaesthetics, others have reported no benefit or reduction in analgesic requirement. [17] In view of limited research, this study was thus conducted to ascertain the analgesic efficacy of intraperitoneally instilled ropivacaine and bupivacaine as a convenient and cost-effective modality for post-operative analgesia sparing the use of opioids and nonsteroidal anti-inflammatory drugs and hence ensuring safe analgesia after laparoscopic cholecystectomy.

MATERIAL AND METHODS

This prospective study was conducted in the Department of General Surgery, Government Medical College &Rajindra Hospital, Patiala. After taking written informed consent, patients undergoing laparoscopic cholecystectomy were enrolled and were randomized among three groups of thirty patients each on the basis of computer-generated table of randomization. In group A, patients were given 0.9% of normal saline as placebo in gall bladder fossa (20 ml) after the removal of gall bladder. In group B, patients were instilled with 20 ml of ropivacaine (0.75%) in gall bladder fossa after the removal of gall bladder. In group C, patients were instilled with 20 ml of bupivacaine (0.25%) in gall bladder fossa after the removal of gall bladder.

Inclusion Criteria : Elective cases in the age group of 20 to 70 years were included in the study.

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Exclusion criteria : Patients with age > 70 years and in poor general condition were excluded from the study. Patients with Recent myocardial infarction (< 3 months prior to surgery), acute cholecystitis and with multiple co-morbidities were not included in the study. Those who could not understand Visual analog scale were also excluded.

Method of administration: The time of arrival in the postoperative recovery room was defined as zero hour postoperatively. The subjective as well as objective feeling of pain was recorded as per the requirement of analgesic by the patient. Pain intensity was measured at 0, 4, 8, 12, 24 hour postoperatively. The postoperative pain was evaluated with VAS (Visual Analogue Scale). Scale "0" corresponded to no pain and "10" to the most severe pain the patient had ever experienced. VRS (Verbal Rating Scale) score was also used to assess pain.

The pain VAS (Visual Analogue Scale) was self-completed by the respondent. The respondent was asked to place a line perpendicular to the VAS line at the point that represents their pain intensity. [18-20]

Scoring: Using a ruler, the score was determined by measuring the distance on the 100-mm line between the "no pain" anchor and the patient's mark, providing a range of scores from 0–10.[21]

Score interpretation: A higher score indicated greater pain intensity. Based on the distribution of pain VAS (Visual Analogue Scale) scores in postsurgical patients (knee replacement, hysterectomy, or laparoscopic myomectomy) who described their postoperative pain intensity as none, mild, moderate, or severe, the following cut points on the pain VAS (Visual Analogue Scale) had been recommended: no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), and severe pain (75–100 mm).[22] Normative values are not available. The duration of the first rescue analgesic requirement, VAS score > 3 was noted.

Nausea and vomiting were assessed depending upon the episodes, number & need for antiemetic medication. Nursing staff and resident on duty kept a record of vomiting and nausea.

All the observations were noted in the proforma. The observation comprised postoperative analgesic consumption in terms of number of injections over specified intervals. Analgesic used was diclofenac given by intramuscular route within 4, 12, 24 hours post-operatively.

RESULTS

There was no significant difference found in the age, gender and weight of the patients between the three groups (Table 1). Laparoscopic cholecystectomy was performed in Normal saline group in 8 men and 22 women with mean age of 43 years and mean weight of 70 kgs and in ropivacaine group in 8 men and 22 women with mean age of 41 years and mean weight of 74 kgs, and in bupivacaine group in 7 men and 23 women with mean age of 43 years and mean weight of 68 kgs. The mean intensity of postoperative pain assessed by visual analogue scale at 0, 4, 8, 12 and 24 hours was highest in Normal Saline group among the three groups. On comparing the groups, VAS (visual analogue scale) was statistically significant in normal saline group as compared to ropivacaine group at 0 hours (p=0.000), at 4 hours (p=0.001), at 8 hours (p=0.001), and at 12 hours (p=0.029) and non-significant at 24 hour(p=1.000). Between normal saline group and bupivacaine group, VAS (visual analogue scale) was more in normal saline group than bupivacaine group at 0 hours (p=0.000), at 4 hours (p=0.017) and at 8 hours (p=0.010) and non-significant at 12hrs

(p=1.009) and at 24 hours (p=1.003).While as pain intensity in bupivacaine group was more but statistically non-significant than ropivacaine group at all time intervals. (Table 2 & Figure1)

The mean intensity of postoperative pain assessed by verbal rating scale at 0, 4, 8, 12 and 24 hours was also highest in Normal Saline group among the three groups. Comparing normal Saline group and ropivacaine group, verbal rating scale was more and statistically significant in normal saline group as compared to ropivacaine group at 0 hours (p=0.000), and 8 hours (p=0.000) and non-significant at 4 hours (p=0.105),12 hours (p=0.066) and 24hrs (p=0.0154). Between normal saline group and bupivacaine group, VRS (verbal rating scale) was more and statistically significant in normal saline group at 0 hours (p=0.000),4 hours (p=0.046) and 8 hours (p=0.024) and non-significant at 12 hours (p=1.000) and 24 hours (p= 0.502). While comparing ropivacaine group with bupivacaine group, Verbal Rating Scale was statistically non-significant between both groups at all time intervals. (Table 3 & Figure 2)

Time for first rescue analgesic was early in normal saline group and late in ropivacaine group among the three groups. In normal saline group 93% patients received the first rescue analgesic within 4 hours of surgery, in ropivacaine group 60% patients received the first rescue analgesic at 8 hours and in bupivacaine group 80% patients received the first analgesic within 8 hours of surgery. (Table 4)

The amount of rescue analgesic used was highest in normal saline group among the three groups and almost similar in ropivacaine and bupivacaine groups. (Table 4)

In our study, incidence of adverse events such as nausea and vomiting were found to be insignificant. post op nausea and vomiting were seen in 3 patients in group A (10%), 3 patients in group B (10%) and 4 patients in group C (13.3%). The difference among the three groups in view of incidence of nausea or vomiting was statistically non-significant. (p>0.005).

Table 1: Demographic Data

	Group A	Group B	Group C
Age (in years)	43.20±12.86	41.37±9.86	43.10±12.61
Gender (Male:female)	8/22	8/22	7/23
Body weight (in kgs)	70.33±8.89	74.43±8.85	68.43±10.11

Table 2: Visual Analog Scale

Time Interval (in hours)	Group A	Group B	Group C	p value A vs B	p value A vs C	p value B vs C
0	4.47±1.16	2.03±0.61	2.07±0.36	0.000	0.000	1.000

4	3.13±1.38	2.13±0.50	2.6±1.10	0.001	0.165	0.277
8	3.13±1.07	2.2±0.66	2.63±0.92	0.000	0.105	0.201
12	2.7±1.11	2.03±0.71	2.47±1.04	0.029	1.000	0.266
24	1.57±0.72	1.6±0.62	1.6±0.67	1.000	1.000	1.000

Table-3: Verbal Rating Scale

Time Interval (in hours)	Group A	Group B	Group C	p value A vs B	p value A vs C	p value B vs C
0	2.87±0.43	1.83±0.46	1.87±0.68	0.000	0.000	1.000
4	2.27±0.74	1.83±0.64	1.77±0.93	0.005	0.046	1.000
8	2.23±0.77	1.33±0.71	1.7±0.79	0.000	0.024	0.196
12	1.83±0.83	1.3±0.75	1.73±1.04	0.066	1.000	0.185
24	1.13±0.81	1.03±0.76	0.83±0.91	1.000	0.502	1.000

Table-4: Group Comparison for Analgesic Use

	Group A	Group B	Group C
Mean No. Of Analgesic Used	1.87±0.730	1.07±0.785	1.27±0.907
Time Taken To Receive First Analgesic (In Hours)	2.81±0.80	8.68±0.78	7.51±1.20

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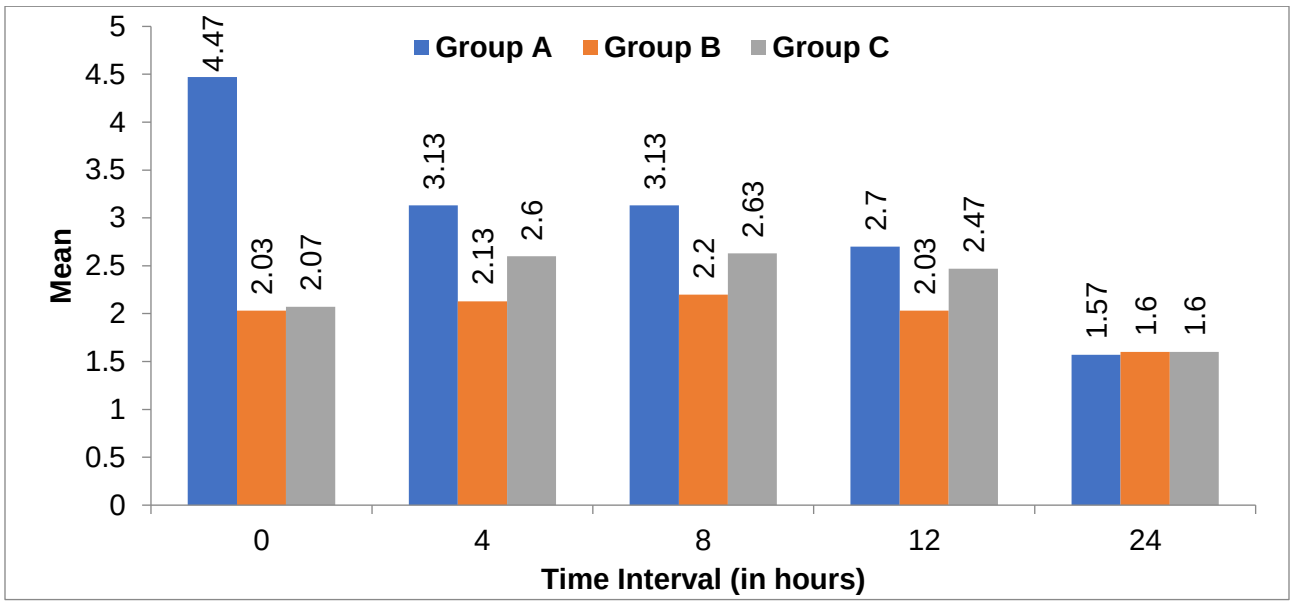

Figure 1: Visual Analog Scale

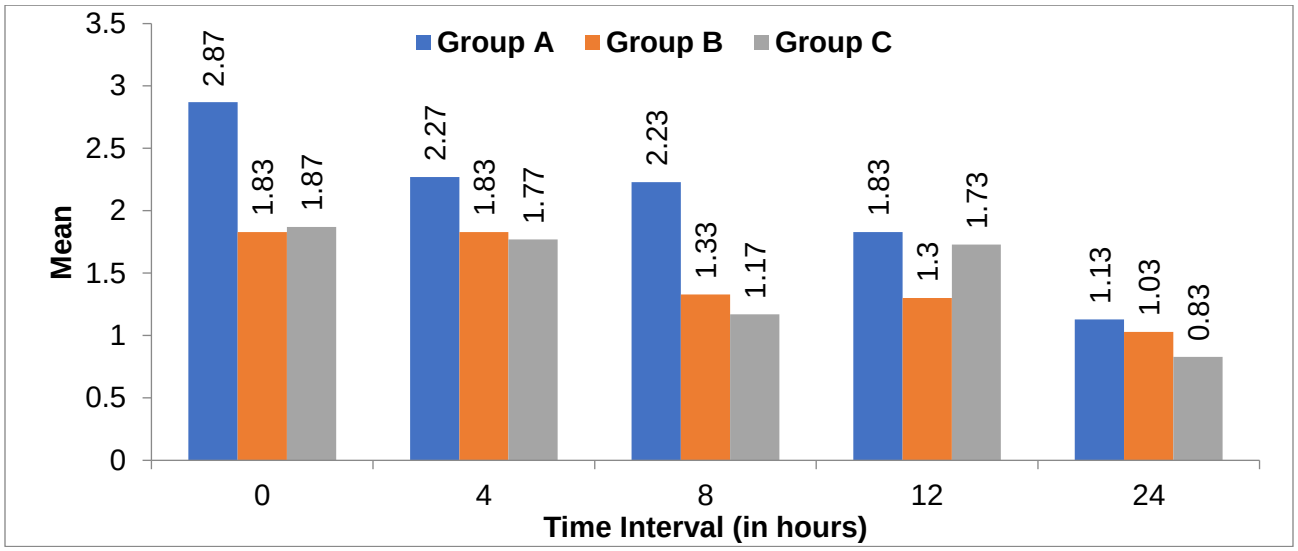

Figure 2: Verbal Rating Scale

DISCUSSION

Since postoperative pain is multifactorial in origin, multimodal therapy was needed to optimize pain relief. Improved postoperative pain management using opioid sparing regimens facilitated high success rates of laparoscopic cholecystectomy. The accurate assessment of pain was difficult because of its individual threshold, subjectivity and difficulty in measurement.

The total number of females which is 67 in the study was more compared to that of males (23) in the study groups. This may be explained by the fact that the disease has a female preponderance which was also found in various similar studies [23],[24],[25].

The mean intensity of postoperative pain assessed by visual analogue scale at 0, 4, 8, 12 and 24 hours was highest in Normal Saline group among the three groups thus concluding that both bupivacaine 0.50% and ropivacaine 0.75% were equally effective for intraperitoneal instillation at the end of laparoscopic cholecystectomy for post-operative pain relief upto 12 hours. Meena *et al.*[26] in their study also found that mean visual analogue score was lower in both the groups receiving intraperitoneal ropivacaine and bupivacaine and that the ropivacaine group had significantly lower visual analogue score from the 5^{th} postoperative hour to 12^{th} hour ($p<0.005$). This result was similar to our study. results were also in concordance with various other studies. [27],[28],[29],[30]

In our study, VRS (verbal rating scale) score was found to be lower in both ropivacaine and bupivacaine groups as compared to normal saline group. Our results were similar to study done by Meena *et al.* [26] who also found that mean VRS (verbal rating scale) score was lower in both the bupivacaine and ropivacaine groups with significant difference between the VRS score in immediate postoperative period, 1^{st} hour, 3^{rd} hour, and then from 7^{th} hour to 12^{th} hour, Ropivacaine being superior over Bupivacaine. This result was similar to our study.

On comparing the three groups on the basis of rescue analgesic used, ropivacaine was found to be better than bupivacaine as well as normal saline in terms of lesser number of rescue analgesic used as well as greater time taken to first analgesic use in postoperative period.

The mean time for first rescue analgesic was found to be shorter in normal saline group than ropivacaine and bupivacaine groups. The difference was statistically significant between normal saline group and ropivacaine group ($p<0.0001$), between normal saline group and bupivacaine group ($p<0.0001$) and also between ropivacaine group and bupivacaine group ($p<0.0001$) concluding that intraperitoneal ropivacaine is superior than bupivacaine as well as normal saline in providing longer postoperative analgesia in laparoscopic cholecystectomy patients. Our study is in consonance with the study conducted by Singh *et al.* [24] who found that the time to first analgesic request was shortest in normal saline group (24.60±10.50 minutes) compared to ropivacaine group (264.00±120.00 minutes) ($p<0.001$). Various other studies also corroborated similar results.[27],[31]

The adverse effects noted by us were nausea and vomiting, which were statistically non-significant among the three groups. Similar adverse effects of nausea and vomiting were also found in previous other studies and were insignificant.[31],[32]

Thus, the present study revealed that both the local anaesthetics 0.5% bupivacaine as well as 0.75% ropivacaine were effective in decreasing the VAS (Visual Analogue Scale) and VRS (verbal rating scale) scores upto 12 hours post operatively.

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