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The Use of Local Anesthesia for Relief of Postoperative Pain After Laparoscopic Cholecystectomy

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Abstract

Background The postoperative pain remains the most prevalent complaint after laparoscopic cholecystectomy for cholelithiasis, which may lead to prolong hospital stay.

Objective To evaluate the effect of wound infiltration and intraperitoneal instillation of Bupivacaine for relief the postoperative pain (within first 24 hours) in patient undergoing laparoscopic cholecystectomy.

Methods A randomized study included 60 patients having symptomatic gallstones attending Al-Yarmouk Teaching Hospital, Department of Surgery, Baghdad, Iraq, during the period from December 2018 to December 2019; for elective laparoscopic cholecystectomy. Patients were divided into two equal groups; in group (A), intraperitoneal 10 ml bupivacaine (0.5%) was given for postoperative pain relief, while group (B) was not given this local anesthesia. The postoperative pain was assessed by Visual Analogue Scale score at fixed time intervals starting 1, 2, 4, 6 hrs then 12, 18 and 24 hrs postoperatively.

Results In group A, 33.3% (n=10) of patients had abdominal pain that needed additional analgesia, while 66.6% (n= 20) of patients, they didn't need additional analgesia. In group B, 93.3% (n=28) of patients had pain and needed additional analgesia, whereas 6.6% (n=2) of patients, they didn't need additional analgesia. The incidence of shoulder pain was 10% (n=3) in group A and 20% (n=6) in group B.

Conclusion The wound infiltration and intraperitoneal instillation of local anesthesia significantly reduces abdominal pain (first 12 hrs), also reduces the need for post-operative additional analgesia, while local anesthesia had no significant effect on shoulder tip pain, post operatively.

Keywords Laparoscopic cholecystectomy, local anesthesia, post operative pain

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List of abbreviations: ASA = American Society of Anesthesiologist, IPLA = Intraperitoneal local anesthetic, LA = Local anesthesia, LC = Local cholecystectomy, VAS = Visual analogue score

Introduction

Laparoscopic cholecystectomy (LC) is considered the standard technique to remove symptomatic gall bladder [(1)]. The pain, which happened after this technique is less and shorter than that caused by open cholecystectomy [(2,3)].

Opioids and non-steroidal anti-inflammatory drugs (NSAIDs) are generally used for treating the post-operative pain after LC with variable success [(4)]. The advantage of infiltration of wounds with local anesthetics (LA), their intraperitoneal instillation as well as the choice and dosages of LA remain controversial [(5)].

Time and pattern of pain after LC on the day of surgery is typically a diffuse abdominal pain, a more so to the right upper quadrant and right shoulder tip [(6,7)]. The pain after laparoscopy is associated with persistent pneumoperitoneum,

sometimes for 3 days, there is significant correlation between gas volume and pain scores [8].

A number of studies reported various treatment modalities to relieve pain after LC. A therapeutic approach using intraperitoneal local anesthetic (IPLA) is remarkable because the beneficial effect of this strategy is closely linked to pain characteristics after LC, which primarily arises from pneumoperitoneum [9]. Bupivacaine is a potent LA with unique characteristics from the amide group of LA.

LA are used in regional anesthesia, epidural anesthesia, spinal anesthesia, and local infiltration. LA generally block the generation of the action potential in nerve cells by increasing the threshold for electrical excitation [10]. Bupivacaine has been demonstrated to produce longer peripheral neural blockade with duration of (6–12 hrs) than lidocaine (1-2 hrs) as such bupivacaine is commonly used for long-acting anesthetic effects, with onset of action within 15 mints and the safe dose is 0.25% mg/kg with maximum dose 2 mg/kg if used without adrenaline [11,12].

This study aimed to evaluate the effect of wound infiltration and intraperitoneal instillation of Bupivacaine for relief the postoperative pain (within first 24 hours) in patient undergoing LC.

Methods

This is a prospective, randomized study conducted in the Department of General Surgery at Al-Yarmouk Teaching Hospital, during the period from December 2018 to December 2019. Patients underwent elective LC for symptomatic cholelithiasis were included in this study.

Seventy-five (75) was the total number of patients, fifteen (15) patients were excluded and only sixty (60) patients were included in this study. All of them belong to American Society of anesthesiologist (ASA) class 1 or 2 (Table 1).

Table 1. American Society of anesthesiologist (ASA) classification of patients' physical pain

ASA class	Physical status
1	Normal healthy patient
2	Patient with mild systemic disease
3	Patient with severe systemic disease
4	Patient with severe systemic disease that is a constant threat to life
5	Moribund patient not expected to survive without emergent procedure

All the data were recorded including (age, gender, weight of the patients, details of procedure, site of pain, CO_2 pressure, duration) and post-operative assessment (pain score, post-operative pain) and the use of visual analogue score (VAS) was explained to the patients, and informed consent was obtained before operation.

Inclusion criteria:

All patients with symptomatic cholelithiasis

Exclusion criteria

Patients unable to understand the VAS (7 patients), conversion to open surgery (5 patients), or patients having CBD stones (3 patients).

Patients were divided into two groups, each of group with 30 patients.

The operation started under general anesthesia with endotracheal intubation using Thiopentone, Halothane-Succinylcholine (muscle relaxant) and Attracurium (as this drug was the only available one and used by the anesthetist during that period of data collection). Pneumoperitoneum was produced by insufflation of CO_2 using Verres needle method (closed technique). The intraperitoneal pressure maintained between 12-14 mmHg. Classical four ports were done. Patients was placed in reverse Trendelenburg and tilt slightly to the left. We used one ampule of Bupivacaine hydrochloride (0.5%) contain 20 ml (5 mg/ml), which equal to 100 mg, we took 10 ml from the ampule of bupivacaine (0.50%) diluted in 100 ml of (0.9%) Normal saline and installed in the sub diaphragmatic and sub hepatic spaces under vision using the sucker.

The other 10 ml from the ampule of Bupivacaine (0.5%) without dilution were used for wounds infiltration and divided as follows; 4 ml for epigastric (10 mm) port site wound at first, then we change the camera from the umbilical to epigastric port, then 4 ml LA for umbilical (10 mm) camera site port wound, and 1 ml for each of the two (5 mm) ports sites wounds.

Time of patient's arrival to the ward (postoperatively) was considered as Zero hr where all the patients were given one Paracetamol vial 1000 mg in this hour. Then the pain intensity was measured at fixed time intervals starting 1, 2 ,4, 6 hrs then 12, 18 and 24 hrs post operatively and was recorded by resident doctors using VAS, also they recorded the number and type of additional analgesic injections that the patient was needed with special forma.

Data analyzed using statistical package for social sciences (SPSS) version 25. The data presented as mean, standard deviation or frequencies and percentages. Independent t-test (two tailed) and Chi square tests were used. P value less than 0.05 was considered significant.

Results

The total number of study participants was 60. All of them had LC for symptomatic cholelithiasis. They were divided into two groups: LA group included 30 patients received LA (as wound infiltration and intraperitoneal instillation) to relieve abdominal pain and control group included the other 30 patients who didn't receive LA.

General characteristics

The distribution of study groups by general characteristics (age and gender) is shown in figure (1).

Study patients' age was ranging from 22 to 68 years with a mean of 42.36 years and standard deviation (SD) of ± 12.04 years. The highest proportion of study patients in LA group was aged <40 years and between 40-59 years (43.3% in both) and in control group was aged between 40 - 59 years (46.7%).

Regarding gender, proportion of females was much higher than males in LA and control groups (86.7%, 83.3% respectively).

Concerning BMI (body mass index) level, the highest proportion of study patients in LA and control groups was overweighed (80% for both).

Surgical information

It was noticed that the highest proportion of study patients needed more than 60 min for duration of surgery in LA and control groups (70% versus 76.7% respectively). Regarding CO_2 pressure, 50% of LA and control groups had their surgery with CO_2 pressure of 12 mmHg (Figure 2).

VAS for abdominal pain

The comparison in means of VAS score of pain between study groups postoperatively at abdominal level are shown in table (2). The means of VAS score after 1, 2, 4, 6, and 12 hrs. after operation were significantly lower in LA group than that in control group (1.63 versus 2.46, P= 0.002; 1.5 versus 2.76, P= 0.001; 1.6 versus 2.8, P= 0.001; 2.0 versus 4.36, P= 0.001; and 2.33 versus 4.46, P= 0.001 respectively).

No statistically significant differences (P ≥0.05) in mean of VAS score between study groups at abdomen level after 18 and 24 hrs.

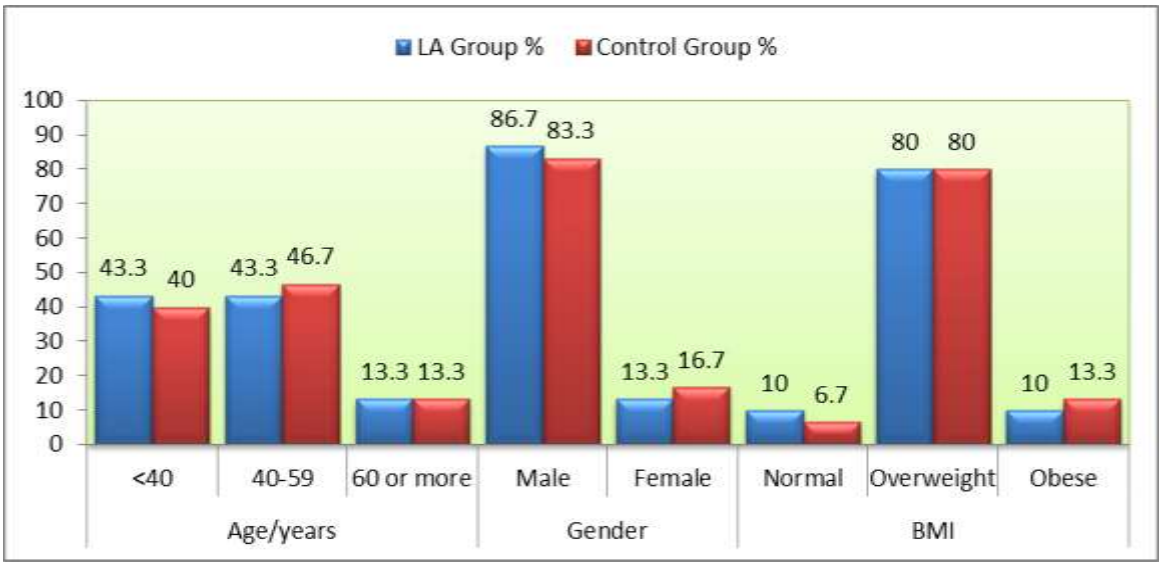

Figure 1. Distribution of study groups by age, gender and body mass index

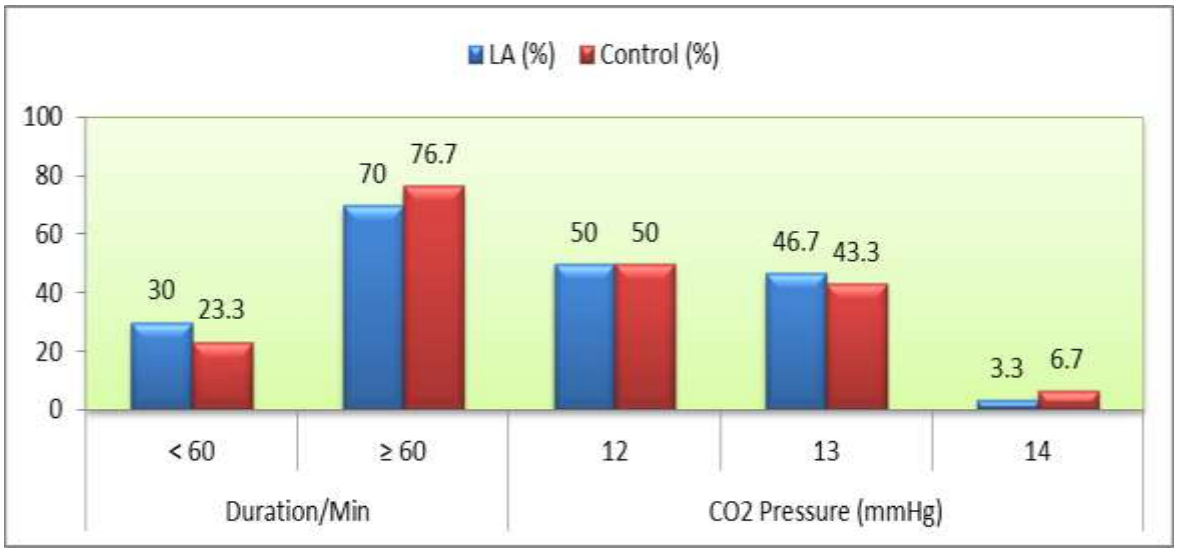

Figure 2. Distribution of study groups by surgical information

Table 2. Comparison in means of VAS score of pain between study groups postoperatively at abdominal level

Time	VAS Score for pain		P Value
	LA group Mean±SD	Control group Mean±SD	
After 1 hr	1.63±0.61	2.46±1.27	0.002
After 2 hrs	1.5±0.5	2.76±1.71	0.001
After 4 hrs	1.6±0.67	2.8±1.58	0.001
After 6 hrs	2.0±0.9	4.36±2.55	0.001
After 12 hrs	2.33±1.12	4.46±2.78	0.001
After 18 hrs	2.83±1.6	3.73±2.24	0.079
After 24 hrs	2.5±0.9	2.86±0.8	0.089

VAS for shoulder tip pain

Table 3 shows the comparison between study group according to shoulder tip pain after operation. No statistically significant differences (P ≥0.05) between study groups regarding shoulder tip pain after operation.

Table 3. Comparison between study group according to shoulder tip pain after operation

Shoulder tip pain		Study group		Total (%) n= 60	P Value
		LA (%) n= 30	Control (%) n= 30		
After 1 hr	Yes	0 (0.0)	1 (3.3)	1 (1.7)	0.313
	No	30 (100)	29 (96.7)	59 (98.3)	
After 2 hrs	Yes	0 (0.0)	0 (0.0)	0 (0.0)	1.000
	No	30 (100)	30 (100)	60 (100)	
After 4 hrs	Yes	0 (0.0)	0 (0.0)	0 (0.0)	1.000
	No	30 (100)	30 (100)	60 (100)	
After 6 hrs	Yes	0 (0.0)	0 (0.0)	0 (0.0)	1.000
	No	30 (100)	30 (100)	60 (100)	
After 12 hrs	Yes	1 (3.3)	0 (0.0)	1 (1.7)	0.313
	No	29 (96.7)	30 (100)	59 (98.3)	
After 18 hrs	Yes	0 (0.0)	2 (6.7)	2 (3.3)	0.150
	No	30 (100)	28 (93.3)	58 (96.7)	
After 24 hrs	Yes	2 (6.7)	5 (16.6)	7 (11.7)	0.228
	No	28 (93.3)	25 (83.4)	53 (88.3)	

Use of additional analgesia

The association between study group and using of additional analgesia is shown in table (4). In this study, 90.9% of patients who didn't need additional anesthesia were received local anesthesia (LA group) with a significant association (P= 0.001) between study group and using of additional analgesia.

Table 4. Association between study group and using of additional analgesia

Use of additional analgesia	Study group		Total (%) n= 60	P - Value
	LA (%) n= 30	Control (%) n= 30		
Yes	10 (26.3)	28 (73.3)	38 (63.3)	0.001
No	20 (90.9)	2 (9.1)	22 (36.7)	

VAS score of abdominal pain according to duration of surgery

<60 min

The comparison in means of VAS score of pain between study groups in patients with duration of surgery less than 60 mins. is shown in table (5).

There were no significant differences (P ≥0.05) between study groups in means of VAS score of pain in patients with duration of surgery less than 60 min in all times after operation.

≥60 min

The comparison in means of VAS score of pain between study groups in patients with duration of surgery ≥60 min is shown in table (5). Means of VAS score of pain after 1, 2, 4, 6, and 12 hrs were significantly lower in LA group than that in control group (1.61 versus 2.56, P= 0.006; 1.52 versus 2.73, P= 0.002; 1.52 versus 2.86, P= 0.001; 1.85 versus 4.39, P= 0.001; and 2.33 versus 5.0, P= 0.001 respectively).

There were no significant associations (P ≥0.05) between study group in means of VAS score of pain in patients with duration of surgery ≥60 min after 12 and 24 hrs postoperatively.

Table 5. Comparison in means of VAS score of pain between study groups in patients with duration of surgery < 60 min and ≥60 min

Duration of surgery	VAS Score for pain in patients with duration of surgery <60 min			VAS Score for pain in patients with duration of surgery ≥60 min		
	LA Mean±SD	Control Mean±SD	P value	LA Mean±SD	Control Mean±SD	P value
After 1 hr	1.66±0.7	2.14±0.89	0.255	1.61±0.58	2.56±1.37	0.006
After 2 hrs	1.44±0.52	2.85±2.03	0.063	1.52±0.51	2.73±1.65	0.002
After 4 hrs	1.77±0.97	2.57±1.13	0.154	1.52±0.51	2.86±1.71	0.001
After 6 hrs	2.33±1.32	4.28±2.62	0.072	1.85±0.65	4.39±2.58	0.001
After 12 hrs	1.77±0.44	2.71±1.25	0.055	2.33±1.42	5.0±2.92	0.001
After 18 hrs	2.44±1.58	3.71±2.05	0.185	2.76±1.75	3.73±2.33	0.128
After 24 hrs	2.44±1.5	3.65±0.89	0.067	2.85±0.57	3.39±1.43	0.252

Discussion

Early pain after LC is a complex process and includes different pain component secondary to different pain mechanisms, such as surgical trauma secondary to gall bladder removal, abdominal distention, and pneumoperitoneum using CO_2 [13]. Adequate early postoperative pain relief after LC is an essential goal to help the patient discharge home early with minimum pain and in stable condition [14].

In this study, intraperitoneal instillation had been done and ports sites infiltration with Bupivacaine (0.5%) had been ensured, which found to be useful in reducing the intensity of

pain after LC and there was significant difference in the total amount of analgesia required between the two groups (LA group compared control group). The current results are in agreement with a study by Al kazwini in 2017 [15], which concluded that intraperitoneal installation was effective in reducing immediate postoperative pain following LC, while the study conducted by Hosseini et al. in 2013 showed that intraperitoneal administration of Lidocaine 200 ml after elective LC has no considerable effect on the abdominal and scapular pain [16]. But it is disagreeing with Gluck et al. randomized controlled trial in 2021, who found that the level of postoperative pain, either at rest or with change of position, was not significantly different between the groups, at all-time points. Application of subcutaneous and/or intraperitoneal analgesia is not effective in reducing pain after operative laparoscopy [17].

The current study showed that intraperitoneal instillation of LA had little effect on postoperative shoulder pain and this was consistent with the findings of other study done by Cunningham et al. in 2020, in which there was a significant reduction in shoulder-tip pain scores in the Levobupivacaine group at 3 hrs, then a significant reduction in wound-pain scores in the Levobupivacaine group at 8 hrs (p=0.04) and at day 4 postoperative [18]. This variation in results could be due to the variation and effects of different factors like in adverse event profile, dosing and toxicity, pharmacodynamics, pertinent for members of the inter professional team for the treatment of patients when local anesthesia is warranted [19].

Our study showed that the analgesic requirements is less in LA group compared with control group. This supported by other study Yeh et al. in 2014, in which combined wound and intraperitoneal LA use after LC significantly decreased the immediate postoperative pain and may explain the reduced use of Meperidine and earlier discharge of patients so treated [20].

In conclusion, the use of Bupivacaine in the intraperitoneal instillation and wound infiltration significantly reduces postoperative abdominal pain after LC in first 12 hrs, also reduces requirements for additional analgesia especially in those whose surgery lasts ≥60 min. While intraperitoneal subdiaphragmatic instillation of Bupivacaine was not effective in reducing shoulder pain, in the early postoperative period.

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Author contribution

Dr. Mallallah: Data collection, writing and analysis. Dr. Al-Mafrachi: Study design and supervision.

Conflict of interest

None.

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