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PORT SITE INFILTRATION OF LOCAL ANESTHETIC IN REDUCTION OF POST-OPERATIVE PAIN AFTER LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Laparoscopic cholecystectomy has become a standard technique for gallbladder surgery of symptomatic cholelithiasis. However, pain is the dominant complaint after this surgical procedure.
This study aimed to evaluate the efficacy of long acting local anesthetic (Bupivacaine), infiltrated at port sites in amelioration of pain following laparoscopic cholecystectomy.
Seventy two patients underwent elective laparoscopic cholecystectomy enrolled in this study, patients were divided into treatment and control groups of 36 patients each. Following removal of the gallbladder, treatment group received 20 ml of 0.25% Bupivacaine in divided doses at the trocar sites, unlike control group which receive no treatment. The evaluation of postoperative pain was done at fixed time intervals by McGill Pain Questionnaire, and the dosage of narcotic analgesic Tramadol, was also recorded.
Mean pain scores at 6 hours postoperatively in treatment group was less than that of the control group (4.5 and 7.6) respectively with ($p<0.05$). Pain scores at 12 and 24 hours postoperatively did not differ between the two study groups ($p>0.05$). The mean total narcotic analgesic dose used during the first 24 hours postoperatively was less in the treatment group compared to the control group (92 mg and 158 mg) respectively with ($p<0.05$). The localization of pain during the first 24 hours postoperatively was 58% incisional, 36% intra-abdominal, and shoulder tip pain 6%.
In conclusion, postoperative infiltration of long lasting local anesthetic (Bupivacaine) into the port sites of laparoscopic cholecystectomy may be desirable. This is simple, inexpensive, and effective technique to minimize early postoperative pain which can be practiced for elective laparoscopic cholecystectomy.

Introduction

Over the past two decades, laparoscopic cholecystectomy has established itself as a standard of care for cholelithiasis and cholecystitis chronic or acute. Quicker convalescence and shorter hospital stay are the most advantages of laparoscopic cholecystectomy, in the absence of significantly higher complication rate.

Nevertheless in laparoscopic approach, postoperative pain still remain the most important patient's complaint after Laparoscopy[1].

Peripheral use of local anesthetics for postoperative pain relief after laparoscopic cholecystectomy is, in this context, an attractive method which in theory may improve early pain control and minimize the need for opioids[2].

A lot of authors keep into focus the different mechanisms of pain after laparoscopic cholecystectomy. In this kind of procedure, pain can be divided into three components; visceral, parietal and shoulder tip pain. With different intensity and time courses, visceral and parietal pain seems to be the most important during the first 24-48 hours after surgery. In fact, in this period the most common location of pain is the right upper quadrant, the trocar site and the right shoulder[3].

We must also remember that pain is a subjective sensation and its measurement is

difficult: we can also add that pain is not only due to sensory stimulus but also has a motivational and affective component and it must be related with cultural learning and previous experience[4].

Local tissue infiltration seems to be quite effective to prevent and control postoperative pain in the first 24-48 hours[2]. Local tissue infiltration has a lot of advantages: simplicity, safety and low cost, the efficacy of the procedure has been investigated in several studies but without reaching a clear conclusion that shows the real benefits of this technique[5].

Descriptive scales such as mild, moderate, and severe pain or the verbal numerical scale are non-continuous and generally unsatisfactory[6].

The numerical rating scale, face rating scale, visual analogue scale (VAS), and McGill Pain Questionnaire (MPQ) are most commonly used. The MPQ contains 15 sets of descriptors; the patient selects the sets that applied to his or her pain and circle the words in each set that best describes the pain. The words in each class are given a rank according to the severity of pain[6].

Local anesthetics act by producing a conduction blockade of neural impulses in the afferent nerve. Bupivacaine has a half-life of 2.5-3.5 hours and has been reported to have provided pain control for an average of 6 hours. The margin of safety of the Bupivacaine need for anesthesia is wide. At the upper limit of 2.5 mg of Bupivacaine /kg body weight, 100 mg of the drug can be used safely in a patient with lean body mass of 40kgs[5].

The use of regional local anesthetics in combination with general anesthesia, has been investigated in several interventional studies during laparoscopic chole-cystectomy, thus variable anesthetic effects of peri-portal infiltration of local anesthetics, infiltration of the peri-portal parietal peritoneum, intraperitoneal spraying above the gallbladder, infiltration into the gallbladder bed parenchyma, instillation into the sub-diaphragmatic space and into the sub-hepatic space covering the area of the hepato-dudenal ligament have been reported[7].

Aim of the Study

To evaluate the efficacy of long acting local anesthetic (Bupivacaine) infiltrated at port sites in amelioration of pain following laparoscopic cholecystectomy.

Patients and Methods

This is a prospective study (randomized controlled trial) carried out in Al-Sadder Teaching Hospital, Basrah, Iraq, between April 30th to October 31st 2013 in which 84 patients who underwent laparoscopic cholecystectomy were enrolled in this study. Inclusion criteria were the fulfillment of the American Society of Anesthesiologists (ASA) class I or II, while the exclusion criteria were:

1- Conversion to open procedure (n=2).
2- The sub-xiphoid incision was amplified for gall bladder extraction (n=2).
3- Placement of a drain intra-operatively (n=8).
4- Choledocholithiasis (n=0).
5- Previous upper abdominal surgery (n=0).
6- Patient with chronic pain syndromes (n=0).
7- Patients received opioids or tranquilizers and other analgesic drugs before surgery (n=0).
8- History of alcohol or drug abuse (n=0).
9- Patients having papillotomy by endoscopic retrograde cholangio-pancreaticography (ERCP) (n=0).
10- Patients with immediate postoperative complications.

The remaining total number of patients recruited in the study was seventy two patients. All patients were scheduled electively for laparoscopic cholecystectomy in which surgeries were performed by four general surgeons in the department of surgery in the study period.

Laparoscopic cholecystectomies were performed with four ports; access to the peritoneal cavity was gained infra-umbilically by using 10 mm incision via

direct trocar insertion with CO_2 insufflation gas pressure around 12 mmHg. Those patients in turn randomized to treatment and control groups of thirty six patients each. Treatment group are those who received Bupivacaine intra-operatively at the end of the procedure, while control group received no Bupivacaine at all.

Randomization was done consecutively i.e. the first candidate patient was allocated to the Bupivacaine (study arm) while the second was allocated to the no treatment (control arm), and so on.

In the Bupivacaine group, after the delivery of the gallbladder, 20 ml of 0.5% Bupivacaine solution was infiltrated through the abdominal wall around each port site. The total volume of the infiltrated solution was divided proportionally according to the length of the skin incisions (6 ml for the 10 mm incisions and 4 mL for the 5 mm incisions). In all cases, residual carbon dioxide was evacuated at the end of the procedure by compressing the abdomen before closure of the ports.

All assessments were performed by the same individual. Factors assessed included, the short form of McGill Pain Questionnaire (SF-MPQ) Scores:

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) _____	1) _____	2) _____	3) _____
SHOOTING	0) _____	1) _____	2) _____	3) _____
STABBING	0) _____	1) _____	2) _____	3) _____
SHARP	0) _____	1) _____	2) _____	3) _____
CRAMPING	0) _____	1) _____	2) _____	3) _____
GNAWING	0) _____	1) _____	2) _____	3) _____
HOT-BURNING	0) _____	1) _____	2) _____	3) _____
ACHING	0) _____	1) _____	2) _____	3) _____
HEAVY	0) _____	1) _____	2) _____	3) _____
TENDER	0) _____	1) _____	2) _____	3) _____
SPLITTING	0) _____	1) _____	2) _____	3) _____
TIRING-EXHAUSTING	0) _____	1) _____	2) _____	3) _____
SICKENING	0) _____	1) _____	2) _____	3) _____
FEARFUL	0) _____	1) _____	2) _____	3) _____
PUNISHING-CRUEL	0) _____	1) _____	2) _____	3) _____

The dominant site of postoperative pain, analgesic requirements during the first 24 hours postoperatively, and any possible side effects attributed to Bupivacaine. Opioid requirement (Tramadol) of all patients in the postoperative period (first 24 hours) was also recorded. Each patient was given 50mg–100mg of Tramadol either by intravenous (IV) infusion or slow IV injection (2-3 minutes) on requirement and the total number of doses of tramadol used was recorded.

The time of arrival in the postoperative ward was defined as (0 hour) postoperatively. Pain intensity was measured at fixed time interval at 6 hours, 12 hours, and 24 hours respectively using an Arabic version of the short-form McGill Pain Questionnaire (SF-MPQ).

The initial eleven descriptors represent the sensory dimension of pain experience while the last four descriptors represent the affective dimension. Each descriptor is ranked on an intensity scale of (0=none), (1=mild), (2=moderate), and (3=severe).

Differences between the Bupivacaine and Control groups regarding pain scores and analgesic requirements postoperatively were assessed by using Chi-Square Test. A p-value of less than 0.05 was considered statistically significant.

Results

The seventy two patients were divided equally into two groups, the mean age; mean weight and sex distribution of both groups were shown in Table I.

Table I: Patients Demography

Patients Characteristics	Group I (n=36) Bupivacaine	Group II (n=36) Control	p-value
Mean Age (Years)	46 ± 3.51	49 ± 3.66	0.47
Mean Weight (Kg)	74.5 ± 4.54	72 ± 4.71	0.387
Sex Ratio (F:M)	29 : 7	30 : 6	

The mean operating time in the Bupivacaine group was (75±0.51) minutes and that of the control group was (68±0.40) minutes and were not found to be statistically significant (p>0.05).

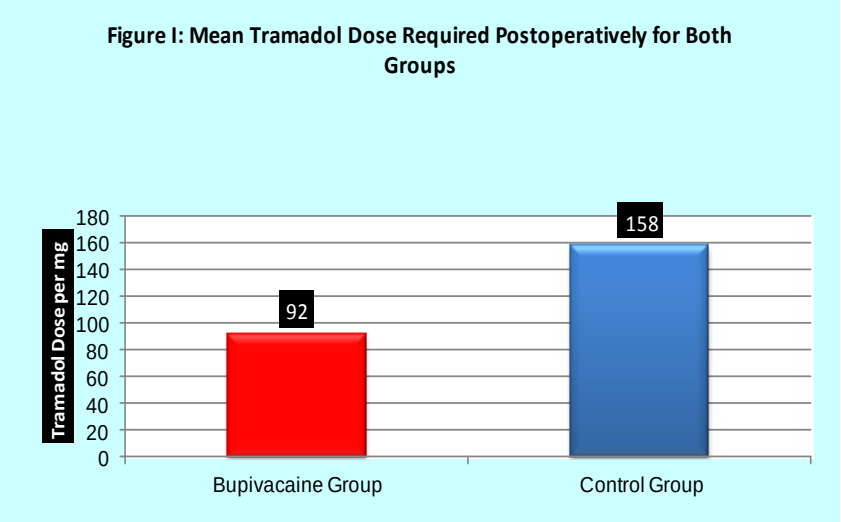
The mean gas pressure in the Bupivacaine group was (13.2±0.9 mmHg) and that of the control group was (12.4±0.47), and both were not found to be statistically significant (p>0.05).

Intensity of pain was assessed at fixed time intervals at 6 hours, 12 hours, and 24 hours postoperatively using SF-MPQ and they show that, there were a significant difference in the mean pain score at six hours postoperatively (p<0.05) while there were no significant difference at 12 and 24 hours postoperatively (p>0.05) as shown Table II.

Table II: Mean Pain Scores for Bupivacaine and Control Groups Postoperatively

Postoperative Assessment Time (Hours)	Bupivacaine Group	Control Group	p-Value
6	4.5 ± 0.32	7.6 ± 0.41	< 0.05
12	2.1 ± 0.25	2.3 ± 0.6	> 0.05
24	1.8 ± 0.81	2.1 ± 0.54	> 0.05

The mean total dose requirement of Tramadol in the Bupivacaine Group in the first 24 hours postoperatively was (92±0.64) mg, while that in the Control Group was (158±0.21) and the difference was found to be statistically significant (p<0.05) as shown in Figure 1.



There were no adverse effects such as cardiovascular alterations, circumoral numbness, nystagmus, muscle fasciculations noted in any patients received Bupivacaine in this study.

The dominant site of pain 6 hours postoperatively was trocar (incisional) site in 42 patients (58%) followed by visceral (abdominal) and shoulder tip sites as shown in Table III.

Table III: Patients Distribution According to the Localization of Pain 6 Hours Postoperatively

Pain Localization Sites	Number of Patients	%
Trocar Sites (Incisional)	42	58%
Visceral (Abdominal)	26	36%
Shoulder- Tip	4	6%
Total	72	100%

Discussion

The postoperative pain after laparoscopic cholecystectomy is an important issue in the surgical practice and any method to reduce such pain is relevant, particularly if it is statistically significant.

Despite the large variation in the pain scores, at least, in the 6th postoperative hour, we did detect difference in pain scores between the Bupivacaine and control groups. Mean pain score at 6 hours was found to be statistically significant.

The current study showed that the infiltration of Bupivacaine into port sites diminishes the peak of pain occurring during the first 6 hours after surgical procedure and significantly reduces the need for narcotic analgesics. Although we expected the effect of the local anesthetic to wear off after a period of 6-8 hours, there was no significant decrease in the pain score at the 2nd and 3rd pain assessment at 12 and 24 hours respectively post-operatively in the patients who received Bupivacaine. The results are similar to that of other studies[8-11].

We found that less Tramadol dose was required in the Bupivacaine Group in the first 24 hours postoperatively, as shown in Figure 1.

When comparing the cumulative incidences of different pain localizations during the first 6 postoperative hours as shown in Table III, incisional pain demonstrate over other pain localization in both study groups.

Although Verma et al[3] said that the pain after laparoscopic cholecystectomy is above all a visceral pain, several studies indicated that the parietal or somatic pain plays an important role to determine postoperative pain as such as visceral one[12,13].

Bisgaard et al. compared the cumulative daily incidences of pain localizations during the first 24 hours postoperatively and they found that pain score was significantly higher for incisional pain compared with intra-abdominal pain and shoulder tip pain (STP)[14]. In fact Cantore et al[2] said that parietal or somatic pain is important as or more than visceral pain in the first postoperative 24-48 hours, so the benefit of local anesthetics is clear.

In surgical literature, the reported overall incidence of postoperative STP varies from 24%[15] to 35%[16], while in the current study, the incidence was low (6%). And this can be explained by the following points:

In this study, the dominant pain localization sites, not the cumulative incidence of pain were reported.

The assessment of pain localizations was done during the first 24 hours postoperatively while STP occurs in the third or fourth postoperative day[2].

In the current study, pain localization assessment was done on patients undergoing laparoscopic cholecystectomy, while in the above mentioned studies, assessment were made on patients

undergoing various laparoscopic procedures.

Our study did not show any side effects of using Bupivacaine as local anesthetic for post-operative pain following laparoscopic cholecystectomy, and this is consistent with the results of Bisgaard et al[14] and Geraldine et al[15].

Conclusion

The study demonstrated that infiltration of the trocar site with long lasting local anesthetic is extremely effective for the treatment of postoperative pain in the first 6 hours after laparoscopic cholecystectomy.

Post-incision infiltration is able to obtain better results than the non-use of these methods both in term of patient pain perception and minimizes the need for opioids analgesics and the technique is very simple and easily applicable.

Recommendations

Port- site infiltration with long lasting local anesthetic is simple, inexpensive, effective technique that improves the postoperative period in hospital course and can be practiced routinely in all elective laparoscopic cholecystectomy.

Limitations of the Study

There was no facility to measure the plasma concentration of Bupivacaine in our patients.

The pain sensation is a subjective feeling, so it was so hard to give an absolutely precise pain evaluation by patients with different pain threshold.

Bupivacaine is not always routinely available in the hospital.

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