

Original Article

Port Site Infiltration and Intraperitoneal Instillation of Bupivacaine for Post Operative Analgesia in Laparoscopic Cholecystectomy

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Abstract:

Laparoscopic cholecystectomy has become the gold standard treatment method for symptomatic gallstone diseases. However pain is the only complaint that delays the discharge. This study aimed to evaluate the efficacy of bupivacaine infiltration into port site and instillation into peritoneal cavity to reduce pain following laparoscopic cholecystectomy. One hundred patients underwent elective laparoscopic cholecystectomy enrolled in this study. Patients were divided into experimental group (Group A) and control group (Group B) of 50 patients each. Following removal of gallbladder, patients of experimental group received 20 ml of 0.5% bupivacaine in gallbladder bed and 20 ml of 0.5% bupivacaine was infiltrated into 4 port sites. Control group received no treatment. The evaluation of postoperative pain was done at 4, 8, 12 and 24 hours postoperatively by using Visual Analogue Scale and the dose of NSAID was also recorded. Mean VAS score at 4, 8 and 12 hours postoperatively in experimental group was less than that of the control group ($p < 0.05$). VAS score at 24 hours postoperatively did not differ between two study groups ($p > 0.05$). The mean total NSAID doses used during first 24 hours postoperatively was less in the experimental group than control group ($p < 0.05$). The localization of pain during first 24 hours postoperatively was 62% incisional, 29% intra abdominal and shoulder tip pain 9%. Port site infiltration and intraperitoneal instillation of bupivacaine following laparoscopic cholecystectomy reduce pain following laparoscopic cholecystectomy and this simple, inexpensive and effective method should be practiced to minimize early postoperative pain for all elective laparoscopic cholecystectomy.

Key words: Laparoscopic cholecystectomy, Pain, Bupivacaine.

Introduction:

Laparoscopic cholecystectomy (LC) has become the gold standard treatment method and most of the patients are being discharged on the first postoperative day¹. Few series have shown that LC is safe and feasible as day care procedure in properly selected patient^{2,3}. One important benefit of laparoscopic cholecystectomy is reduced postoperative pain whereas in open surgery the pain and discomfort from a large abdominal wall incision may be severe enough to prevent early discharge. But still pain relief and patient comfort during early postoperative period remains an issue after LC as pain may delay the discharge.

The pain that a patient feels after laparoscopic cholecystectomy can be divided into 3 types^{4,5}. Visceral pain is deep seated intra abdominal pain due to cholecystectomy. Parietal pain is superficial pain from trocar site due to incision for trocar insertion. Shoulder pain is referred pain due to irritation of diaphragm due to pneumoperitoneum.

Many methods have been tried to reduce the postoperative pain after LC. They include low pressure pneumoperitoneum, gasless technique, use of warm carbon dioxide, peritoneal wash with normal saline, trocar site infiltration of local anaesthetic drugs and instillation of sub diaphragmatic region with local anaesthetic, nonsteroidal anti-inflammatory drugs or steroid⁶.

Peripheral use of local anaesthetics for postoperative pain has become a popular practice in many minor surgical procedures and laparoscopic procedures which may improve early pain control and minimize need for analgesic^{7,8}. Bupivacaine has a half life of 2.5 to 3.5

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hours and has been reported to pain relief for an average of 6 hours. The margin of safety of the bupivacaine need for anesthesia is wide. At a upper limit of 2.5 mg of bupivacaine per kilogram of body weight can be used safely⁵.

The aim of this study is to evaluate the effect of combined intraperitoneal and port site infiltration of bupivacaine for pain relief following laparoscopic cholecystectomy. Secondly, we tried to assess whether this analgesic method reduces the postoperative use of nonsteroidal anti-inflammatory drugs (NSAID).

Materials and Methods:

This is a prospective randomized study conducted in Faridpur Central Hospital, Faridpur for six months. The study population comprised of 100 patients admitted for elective laparoscopic cholecystectomy from July 2017 to December 2017. All the patients were explained about the basis of study and who gave informed written consent to participate in this study were included. Eligible participants were from 15 to 60 years old of both sexes with American society of Anaesthesiologist (ASA) class I (a normally healthy individual) and II (a Patients with mild to moderate systemic diseases). Patient not willing to participate in the study, presented with acute cholecystitis, needed conversion to open cholecystectomy and insertion of a drain at the end of the procedure were excluded from the study.

Patients were randomized into two groups of 50 patients each. Randomization was done consecutively i.e. the first candidate patient was allocated to Group A (Experimental group) while second was allocated to Group B (Control group), and so on. Group A (Experimental group): received bupivacaine in gallbladder bed and in port sites; Group B (Control group): nothing was given in gallbladder bed and port sites.

Before surgery, all patients underwent upper abdominal ultrasound, liver function test, complete blood count, blood sugar, serum creatinine, x-ray chest and ECG. All patients were sent to operation theatre without premedication. Induction of general anaesthesia was performed using propofol and fentanyl and was maintained with oxygen, nitrous oxide and halothane. The anesthetist performed intraoperative non invasive monitoring. Second generation cephalosporin, cefuroxime 1.5 gram was injected before induction of anaesthesia.

Standard 4 ports laparoscopic cholecystectomy was done in all patients. Pneumoperitoneum was created with the use of veress needle through a subumbilical incision and was maintained at 12-14mmHg during entire surgical procedure. After gallbladder extraction irrigation of gallbladder bed of liver with 20 ml of

0.5% bupivacaine was done with suction irrigation tube through epigastric port. After irrigation gas, instrument and trocars no drains were used. Another 20 ml of 0.5% bupivacaine was infiltrated into port sites; 6 ml was infiltrated into each epigastric and umbilical port and 4 ml at each anterior axillary and midclavicular port.

The time of arrival in the postoperative ward was defined as zero hour postoperatively. The intensity of pain was measured using visual analogue scale (VAS) at 4, 8, 12 and 24 hours after surgery. Analgesia requirement was recorded for 24 hours. Each patient was given diclofenac suppository 50 mg 8 hourly on requirement and total number of doses of this NSAID used was recorded. After 24 hours, pain was not too much to give diclofenac suppository. Patients are usually complaining mild pain at port site that are easily managed with oral paracetamol. The method of using the VAS had been explained to all patients preoperatively. The VAS is a horizontal scale representing varying intensities of pain with end pain labeled as "no pain" and the "worst possible pain".

The character of pain and dominant site of postoperative pain was also assessed simultaneously. Visceral pain was defined as deep seated pain located in the right hypochondrium or referred to shoulder. Parietal pain was defined as incisional pain located at trocar sites.

Statistical analysis of data was done using SPSS software. Independent "t" test and chi square test were used for statistical analysis. Differences were considered significant if $p < 0.05$.

Results:

Total 100 patients were enrolled into this study, 50 in the experimental group (Group A) and 50 in control group (Group B). The demographic characteristic of the two groups did not differ regarding age, sex, ASA status and duration of surgery (Table-I).

Table I: Demographic profile

Demographic variable	Group A	Group B	P
Age (Years)	39.51± 6.88	40.02±6.45	0.574
Sex			
Male	12	14	0.368
Female	38	36	
ASA			
I	29	32	0.562
II	21	18	
Duration of surgery (min)	47±5.9	43±3.6	0.471

$P > 0.05$ (not significant), ASA= American society of anaesthesiologist

Intensity of pain was assessed at fixed time interval at 4, 8, 12 and 24 hours after surgery. The mean VAS score of Group A was significantly less than that of the Group B at 4, 8 and 12 hours (p value 0.003, 0.009 and 0.027 respectively). But the VAS score at 24 hours showed no difference between two groups (p value 0.771).

Table II: Comparisons between two groups VAS

Postoperative time	Bupivacaine group	Control group	P value
4 hours	37.09(±0.93)	51.37(±58)	0.003*
8 hours	35.51(±0.73)	50.27(±0.33)	0.009*
12 hours	29.70(±0.51)	41.45(±0.96)	0.027*
24 hours	22.09(±0.46)	30.04(±0.43)	0.771

VAS score ranged from 00 to 100.* indicate statistically significant

Table III shows the dominant site of pain at 6 hours postoperatively. Trocar site pain was dominant followed by visceral pain and shoulder tip pain.

Table III: Patients distribution according to the localization of pain at 6 hours postoperatively.

Pain localization sites	Number of patients	Percentage
Trocar site	62	62%
Visceral	29	29%
Shoulder tip	9	9%
Total	100	100%

Table IV: Analgesic requirement in both groups of patients

Number of doses of NSAID (Diclofenac suppository 50 mg)	Group A n (%)	Group B n (%)	p value
1	16 (32%)	8 (16%)	P = 0.042
2	25 (50%)	20 (40%)	
3 or more	9 (18%)	22 (44%)	

Table IV shows analgesic requirement following LC. In bupivacaine group, 16 (32%) patients required one dose of diclofenac suppository, 25 (50%) patients required two doses and only 9 (18%) patients required 3 or more doses of NSAID. Conversely in control group only 8 (16%) patients required one dose of diclofenac

suppository, 20 (40%) patients required two doses and 22 (44%) patients required 3 or more doses of NSAID. The mean total NSAID doses used during first 24 hours postoperatively was less in the experimental group than control group (p=0.042).

Discussions:

Cholecystectomy is the most common operation of the biliary tract and second most common operative procedure performed today. Laparoscopic cholecystectomy (LC) is the gold standard for symptomatic gallstone diseases and replaced the open cholecystectomy unless there are contraindications to laparoscopic approach. LC is a short stay procedure and therefore, adequate postoperative pain relief is of considerable importance, which makes it ideal for patients.

Postoperative pain in LC is observed in peaks immediately after surgery and decreases after 24 postoperative hours⁴. In this period the most common location of pain is the right upper quadrant, the trocar site and right shoulder. Pain is multifactorial in LC. Incision sites on abdominal wall causing parietal pain, pneumoperitoneum causing shoulder tip pain and visceral pain is due to cholecystectomy in the region of liver bed. Controversy exists about the principal source of pain after LC⁹⁻¹². Some authors mentioned that placement of trocar through abdominal wall is the primary source of pain; whereas other believe that most pain arises from pneumoperitoneum and surgical dissection of gallbladder from liver bed. Therefore pain should be treated multimodally. Here we studied the effect of combined intraperitoneal instillation and port site infiltration of Bupivacaine for analgesia after LC.

The use of local anaesthetic is well recognized in decreasing postoperative pain after LC^{13,14}. The main advantage of local anaesthetic agents is that they do not have the adverse effects of systemically administered opioids, such as postoperative sedation, nausea, gastrointestinal paralysis and respiratory suppression. Local infiltration of bupivacaine act directly and instillation of bupivacaine into peritoneal cavity act by blocking visceral afferent signaling and potentially modifying visceral nociception.

The main scores as calculated from the VAS were significantly less for bupivacaine (Group A) group, compared to non bupivacaine group (Group B) at 4 hours (P=0.003), 8 hours (p=0.009) and at 12 hours (P=0.027), while the difference at 24 hours was not significant (P=0.771). So, this study demonstrated that there is significant reduction of pain after port site infiltration and intraperitoneal instillation of bupivacaine at 4, 8 and 12 hours after LC but no

reduction of pain after 24 hours. Lack of differences in pain in both groups at 24 hours may be due to short half life of bupivacaine. A significant number of papers have examined and the postoperative VAS score was low as compare to present study after port site infiltration and intraperitoneal instillation of bupivacaine in laparoscopic cholecystectomy^{10, 13-17}.

Pain is a subjective sensation and its measurement is difficult. Pain is not only due to sensory stimulus but also has a motivational and affective component¹⁸. The dominant site of pain 6 hours postoperatively in our study was trocar site in 62% of cases followed by visceral pain (29%) and shoulder tip pain (9%). A study by Cantore et al said in their study that parietal or somatic pain is important as or more than visceral pain in the first 24-48 hours postoperatively, so the benefit of local anaesthetic is clear¹⁹. Bisgaard et al, in their study shows incidences of pain localization during first 24 hours postoperatively and they found that pain score was significantly higher for incisional pain compared with visceral pain and shoulder tip pain²⁰. In our study the incidence of shoulder tip pain is 9%, this is much lower than the incidence published in literature²¹. This can be explained by the point that pain localization was done during first 24 hours postoperatively while shoulder tip pain occurs in the second and 3rd postoperative day¹⁹.

A significant number of papers have examined and revealed that the port site infiltration and intraperitoneal instillation of bupivacaine following LC reduces postoperative analgesic requirement^{10,14,18,22}. In our study the mean total NSAID doses used during first 24 hours postoperatively was less in the experimental group than control group ($p<0.05$).

Conclusion:

The pain after laparoscopic cholecystectomy is very important issue in context of early discharge and any method that reduces such pain is relevant, particularly if it is statistically significant. Our study showed combined port site infiltration and intraperitoneal instillation of bupivacaine reduces postoperative pain and reduces postoperative analgesic requirement following laparoscopic cholecystectomy. Thus, this simple technique can be practiced routinely in all elective laparoscopic cholecystectomy.

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