Postoperative Pain Reduction with Bupivacaine Instillation After Laparoscopic Cholecystectomy

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ABSTRACT:

BACKGROUND:

Pain occurs frequently following laparoscopic cholecystectomy leading to increased patients distress, delayed discharge, increase the need for analgesia and delayed oral intake[1,2].

OBJECTIVE:

To evaluate the effect of bupivacaine instillation on pain relief in the early post- operative period following laparoscopic cholecystectomy.

MATERIALS AND METHODS:

Eighty patients having symptomatic gall stones were included in this study. The procedure was explained to the patients and informed consent was obtained. The patients were divided into two groups: group (A) received 40 ml of(0.125%) bupivacaine diluted in 60 ml of isotonic saline(0.9%) instilled in the subdiaphragmatic and subhepatic spaces, the remaining 40ml of (0.125%) bupivacaine were used for wounds infiltration. The post operative pain was assessed by visual analogue scale(VAS) at fixed time intervals, both patients and house officer doctor were blinded to the group of the patients. Group (B) stood as a control group.

RESULTS:

The two groups were comparable in age, gender, weight, and duration of operation. The male to female ratio was (1:4), the mean age in both groups were insignificantly different, their weights ranged from (58- 96) kg. Post operative abdominal pain was significantly lower in group A (bupivacaine group) than group B (control group) in the first twelve hours.

The mean abdominal pain score ranged from (3.85 to 2.55) for the bupivacaine group, and from (6.62 to 3.16) in the control group, the p value is < 0.001which is highly significant in the first 6 hours. Group A had a lower incidence of shoulder pain in comparison with the control group although statistically not significant.

CONCLUSION:

Intraincisional infiltration with bupivacaine is a simple and feasible procedure which significantly reduces post operative pain.

KEY WORDS: laparoscopic cholecystectomy, bupivacaine, postoperative abdominal pain, shoulder pain.

INTRODUCTION:

Laparoscopic cholecystectomy(LC) is now the standard technique for removal of gall bladder which is mainly due to gall stones[2]. Pain which occurs after this procedure is significantly less and shorter than that caused by the open cholecystectomy[3,4,5]. However, post- operative pain still the main obstacles to the patient's return to normal activities [2], and the optimal management has a potential for shortening of hospital stay and for speeding up recovery[4]. Opioids and non-steroidal anti-inflammatory drugs (NSAIDs) are generally used for management of post-operative pain after LC with variable success[1,4]. The choice of drugs, the timing and route of their administration as well as the dosages are variable [6].

The clinical value of infiltration of wounds with local anesthetics (LA), their intraperitoneal application, as well as the choice and dosages of LA still remain controversial [7]. The reduction in pain has made possible earlier discharge from hospital, provided that control of residual pain is not by drugs which causes nausea, ileus or decreased consciousness [7]. Rapid distension of the peritoneum may be associated with tearing of small blood vessels, traumatic traction of nerves and release of inflammatory mediators[8,9]. The prolonged presence of shoulder tip pain suggests excitation of phrenic nerve[7]. Pain may occur in the upper or lower abdomen, shoulder and back,

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It may be transient or persistent for up to 3 days after laparoscopic cholecystectomy[10]. Visceral pain predominates in the first 24 hours, but subsides from peak soon after operation, whereas shoulder pain, minor on first day, increases and becomes significant on the following day[9].

Bupivacaine hydrochloride is a local anesthetic which belongs to amide group of local anesthetics[11]; the duration of action is between 4-6 hours and if used with vasoconstrictor agent, duration increases to 6-20 hours[8,11]. Bupivacaine acts by blockade of voltage gated sodium channels in the nerve fibers preventing generation and conduction of nerve impulses[11]. It is metabolized in the liver by microsomal cytochrome P450[9]. Safe and maximum dose is the same which is 2 mg /kg and toxicity affects mainly CNS and CVS [11]. It cannot be given through IV route, but used as local infiltration of the wound, nerve block, extradural and spinal block[11] . Bupivacaine is available in the following concentrations (0.25%, 0.50% and 0.75%) [11].

Visual analogue scale(VAS) (fig.1) considered as a sensitive and reproducible for expressing pain severity, and takes a little time[12,13]. Which is a tool consisting of 100 mm straight line which is labeled none (no pain) at one end and agonizing (the worst pain possible) at the other end[12]. Scores of(30mm) or less regarded as mild pain(green), scores of (70mm) or more regarded as severe pain(red), scores between (31mm - 69 mm) considered moderate pain(yellow)[12,13].

Although minimal invasive surgery is characterized by reduced pain, it is not painless, and controversy still exists about the principal source of pain after laparoscopic procedures[6]. Early pain after LC is a complex process and includes different pain components secondary to different pain mechanisms, such as peritoneal stretching, diaphragmatic irritation, or to a lesser extent abdominal puncture[6,14].

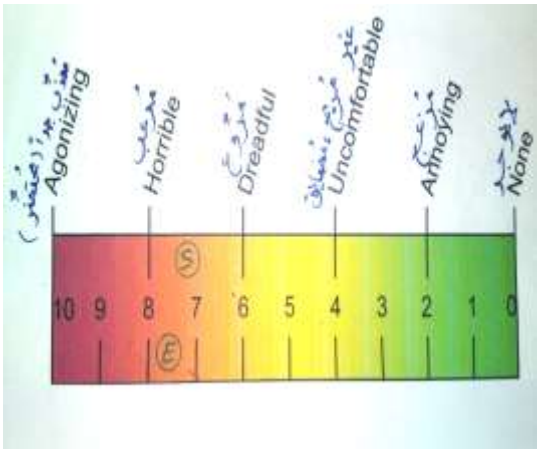

Figure 1 :Visual analogue scale.

MATERIALS AND METHODS:

This prospective, randomized study conducted at Al-Jumhori Teaching Hospital, in Mosul, during the period between October 2009 to December 2010. Eighty patients scheduled to undergo elective LC for symptomatic gall stones were enrolled in this study. All the patients were class (1-2) of the American society of anesthesia. All the data including the details of procedure, the post operative pain and the use of VAS were explained thoroughly to the patients, and their informed consent was obtained prior to surgery, also the weight of the patients were recorded. Patients with acute cholecystitis, choledocholithiasis, or previous upper abdominal surgery, and those who need placement of post operative drain, were excluded from the study.

The patients were randomly allocated into two groups, each group with 40 patients. In group (A) local anesthetic was given and they represent the odd numbers of the total sample, whereas group (B) which represent the even numbers of the sample had not been given bupivacaine (control group). The operation was performed under GA with endotracheal intubation, all patients received the same anesthetic drugs.

Pneumoperitoneum was introduced by insufflation of CO_2 using Hassan's method (open technique) and classical four ports. The intraperitoneal pressure was maintained at 12-14 mmHg, putting the patients in reverse Trendelenburg and right up position.

Local anesthesia was prepared by dilution of 20 ml (100 mg) of bupivacaine hydrochloride (0.50%) by 60 ml (0.9%) isotonic saline, the result was 80 ml with concentration of (0.125%). At the conclusion of the operation and before deflation of the abdomen, 40 ml of bupivacaine (0.125%) diluted again in 60 ml of(0.9%) isotonic saline, which was instilled in the subdiaphragmatic and subhepatic spaces under direct vision. The other 40 ml of LA was used for wounds infiltration and divided as follows; 15 ml for each epigastric and umbilical wounds (10mm port site wounds), and 5ml for each of the lateral two (5mm) ports. We ensured good infiltration of all the layers of the abdominal wall including the preperitoneal tissue, the muscles, the Subcutaneous fat and skin, by using two injections on both sides of the wounds. We put the patients in Trendelenburg position for about five minutes until extubation, to facilitate the accumulation of LA in the sub-hepatic and subdiaphragmatic spaces. At the end of operation the abdominal cavity was deflated carefully, and the residual CO_2 evacuated, the umbilical and epigastric wounds were closed by nylon no. 1.

The time of arrival to the ward (postoperatively) was considered as Zero hour, the pain intensity was measured at fixed times, starting at 1, 3, 6, 12, and 24 hrs by using a horizontal 100mm VAS. Patients who developed pain score more than 3 on VAS, were given analgesic drugs, and the daily analgesic consumption by the patients was also recorded. Resident doctors who had been scoring the pain intensity by the VAS, and the patients themselves were blinded to the patients groups.

RESULTS:

The two groups were comparable in age, gender, weight, and duration of operation as shown in (Table 1). The male to female ratio was (1:4), 14 (17.5 %) males and 66 (82.5 %) females, their age ranged from (23- 65) yrs, the mean age in both groups were insignificantly different; their weights ranged from (58- 96) kg. the duration of operation was longer in group (A).

Table1: Patients characteristics(age, gender , wt, duration of operation).

Patients characters	Group A N= 40	Group B N= 40	Total
Mean age(years)	39.8	42.4	41.5
mean body Wt(Kg)	78	83	81.2
Mean duration of operation (min)	61	55	58.2
Gender (M:F)	8:32	6:34	14:66

The mean postoperative abdominal pain score ranged from (3.85 to 2.55) for the bupivacaine group, and from (6.62 to 3.16) in the control group, which was found to be significantly lower in group A (bupivacaine group) than group B (control group) in the first 12 hours which is statistically significant as shown in (table 2).

Table 2: Mean abdominal pain score for study and control groups.

Time	1hr	3hr	6hr	12hr	24hr
Group A	3.85	2.93	3.28	3.14	2.86
Group B	6.62	5.84	5.30	4.86	3.16
P value	<0.001	<0.001	<0.001	0.02	0.33

Seventeen (42.5%) patients in group A had pain score less than 3 throughout the 24 hours postoperatively, whereas only 3(7.5%) patients in group B had pain score less than 3; so 20(25%) patients did not require analgesia. This was statistically significant as shown in table(3).

Table 3: Requirements for rescue analgesia in study groups.

Group	No analgesic	analgesic	P value
Group A (LA) Group	17(42.5%)	23(57.5%)	0.05
Group B (control Group)	3(7.5%)	37(92.5%)	0.03

Eleven(13.75%)patients developed shoulder pain in the first 24 hours but did not exceed 3.0 scores on VAS, whereas 69(86.25%) patients did not experience shoulder pain in the same period post LC. Group A had a lower incidence of shoulder pain in comparison with the group B although it is statistically not significant as shown in table (4).

Table 4: Incidence of shoulder pain in the study groups (A&B).

Shoulder pain	Yes	No	P value
Group A	4(10%)	36(90%)	0.55
Group B	7(17.5%)	33(82.5%)	0.58

DISCUSSION:

Laparoscopic cholecystectomy is one of the commonest day case surgeries[15]. Although its pain is less intense and lasts for shorter time than open surgery, it remains a problem and may delay discharge of the patient; therefore, adequate early postoperative relief of pain after LC is an essential goal to enable the patient to go home early with little pain and in stable condition[14,16].

In this study intraperitoneal instillation and trocars site infiltration of bupivacaine was found to be beneficial in reducing the intensity of abdominal pain in the early few hrs after operation, which may enhance mobilization and early discharge after surgery, likewise reduction of analgesic requirement in comparison with the control group in patients underwent LC. Our findings are in agreement with other studies done by Elhakim [17], Bhardwaj [18], and Ashraf [14]; who found a reduction in the intensity of pain and analgesic requirements, by using LA after LC. On the other hand, there were studies that failed to demonstrate any pain reduction with intraperitoneal instillation and wound site infiltration of local anesthetic in patients undergoing LC as Ure[19], and Rademaker [20]. The difference between our study and these studies may be attributed to the different responses of the patients to the local anesthetic, in addition to the amount and concentration of the LA .

In the present study we compared bupivacaine group with the control group, and found that bupivacaine group had a good control of postoperative abdominal pain as compared with the control group, these results are consistent with that of Lepner [16] and Hodzic[21]. The pain score for the control group has a highest intensity after 6-8 hours postoperative, with the biggest difference between the two groups at the same period, after that it declined to a level comparable to that of bupivacaine group up to 24 hours. Therefore, the main effect of bupivacaine in this study seems to reduce the pain during the early few hours after LC. This is the period in which the pain is in its highest intensity and the patients need adequate pain relief. Although the half life of bupivacaine is 2.7 hours, but its beneficial effect in soft tissue is up to 12 hours[14,21]. However, we found that there is no subsequent increase in pain score at 12 and 24 hours postoperatively in group A, which was consistent with the results of group B.

Joris[11] et al found that visceral pain accounts for the major discomfort experienced in the early postoperative period. Also they thought that because of existence of several components of pain (somatic, visceral and shoulder) its relief will depend on therapy for each of these components; keeping in mind that anatomic intraperitoneal flow directs local anesthetics

away from cholecystectomy wound. Trendelenburg position causes LA flow over celiac plexus and phrenic nerve ending[22].

Elhakim[19] , and Cunnif[8] have shown that intraperitoneal LA reduces effectively both shoulder pain and abdominal pain after LC. In the present study postoperative shoulder pain is less with patients receive intraperitoneal bupivacaine than the control group, but it is not statistically significant, this was consistent with the findings of a study done by Joris[10], who showed that shoulder pain was very mild in most of patients, this is probably because shoulder pain is very mild on the first day, but becomes more intense on the second day.

Lepner [16], and Alam[6], showed that LA had no effect on shoulder pain within 24 hours after LC. This may be attributed to the short acting effect of the local anesthetic and, that the shoulder pain usually begins late on the second postoperative day. Alexander[11] and Radmaker[18] claim that shoulder pain may persist for 3 days, this may be due to incomplete evacuation of CO_2. In our study, as much as possibleCO_2 was eliminated and this may be the cause of low incidence of shoulder pain.

CONCLUSION:

Wound infiltration of bupivacaine significantly reduces abdominal pain in the initial postoperative period after LC, and reduces the requirements for analgesia, but Intraperitoneal subdiaphragmatic instillation of LA was not significantly effective in reducing shoulder pain, in the early postoperative period.

We recommend to use local anesthetic routinely after laparoscopic cholecystectomy which is a simple safe procedure, to minimize postoperative abdominal pain and analgesic requirement which enhances early mobilization and discharge specially in day case surgery.

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