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Intra-peritoneal Bupivacaine in Two Different concentrations for Effective Pain Relief After Laparoscopic Cholecystectomy

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Abstract: Background: The laparoscopic technique has many advantages compared with open surgery for symptomatic cholecystolithiasis. Despite these advantages, many patients complain about pain after laparoscopic cholecystectomy. **Methods**: A prospective, randomized, double-blinded study at Al-Zahraa university hospital study included 60 patients undergoing elective laparoscopic cholecystectomy. Patients were divided into 2 groups. (Group H received bupivacaine 0.5% (100 mg) was added to 80 ml of normal saline, Group Lreceived bupivacaine 0.5% (100 mg) was added to 280 ml of normal saline) by iteraperitoneal irrigation after extraction of gall bladder Postoperatively the patients were assessed for pain score (VAS), vital signs (heart rate and blood pressure), and analgesic consumption. **Results**: A highly significant difference was found between both groups regarding heart rate, mean blood pressure, amount of analgesia, 1st order of analgesia, VAS of pain ($P<0.05$) but no significant difference regarding age, sex, BMI, So2, shoulder pain ($P>0.05$). **Conclusion:**. Intra-peritoneal instillation of bupivacaine at high concentration causes good pain relief after laparoscopic cholecystectomy. The method is easy, with no adverse effects and may become a routine practice.
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1. Introduction

Laparoscopic cholecystectomy is considered the gold standard treatment for benign gallbladder disease. It ischaracterized by a short hospital stay and an early return to regular activity. [**1]**

Strategies to handle the different intra abdominal surgical pathologies with a laparoscopic approach offer a significant benefit compared with the conventional technique. [**1, 2**]

Laparoscopic cholecystectomy has improved surgical out-come in terms of reduced pain and convalescence com-pared to conventional cholecystectomy. However, the postoperative pain is considerable. Pain management with multiple analgesic and opioids has been reported with variable success. [**2,3**]

The pain in the conventional cholecystectomy is a parietal pain. In laparoscopic cholecystectomy, pain is derived from multiple situations: incision pain (somatic), deep intra abdominal pain (visceral), and shoulder pain (visceral pain due to phrenic nerve irritation). [**4, 5]**

Because postoperative pain after laparoscopic surgery is complex, specialists suggest that effective analgesic treatment should be a multimodal support. This type of support consists on establishing empathy with patients, making them feel confident, explaining the procedure and its complications and administration of a nonsteroidal anti-inflammatory analgesic agent an hour before surgery. **[3,6]**

It should also include blocking the sensitive afferents (infiltrating the skin with a local anesthetic before any incision), administration of an opioid peri-operatively, irrigating a local anesthetic in the peritoneal cavity, providing the patient with fluids and electrolytes. **[5,7]**

The aim of this study was to evaluate the use of the irrigation of a local anesthetic (bupivacaine) in two different concentrations at the surgical bed for postoperative pain reduction. Secondly, we tried to assess whether this analgesia method reduces the postoperative use of nonsteroidal anti-inflammatory drugs (NSAID).

2. Patients and methods

This is a prospective, randomized, double-blinded study at Alzahra university hospital after obtaining local ethics committee approval (provided

by the hospital) and written informed consent. Any unexpected risks encountered during the course of the research were cleared to the participants as well as to the Ethical Committee on time. Every patient will receive an explanation to the purpose of the study and have secret code number to ensure privacy to participants and confidentiality of data.

Inclusion criteria:

ASA grade I and II patients of either sex, between 20 and 60 years old and participants undergoing elective laparoscopic cholecystectomy under general anaesthesia.

Exclusion criteria:

Pregnancy, Allergy to LAs, Acute cholecystitis or gallstone pancreatitis prior to surgery, Current opioid use and Conversion of LC to open cholecystectomy.

Preoperative assessment was done by:-

History taking, Clinical examination and Routine laboratory investigations including: CBC, bleeding time, clotting time, liver function tests, kidney function tests. Sixty patients undergoing elective laparoscopic cholecystectomy were prospectively randomized into 2 groups with concealment of the random sequence. Patients were randomly classified into two equal groups (30 patients each). Group allocation was done by a closed opaque envelope.

Group I (H): intra-peritoneal irrigation was done with 20ml of bupivacaine 0.5% (100 mg) was added to 80 ml of normal saline 0.9% (total volume 100 ml) after gallbladder extraction.

Group II (L): intra-peritoneal irrigation was done with 20 ml of bupivacaine 0.5 % (100 mg) was added to 280 ml of normal saline after gallbladder extraction.

Monitoring:

ECG, pulse oximetry, non-invasive blood pressure and end tidal carbon dioxide was applied to all patients. All the patients will fast for 8 h before surgery and were given uniform premedication with intravenous (IV) injection midazolam 0.025 mg/kg, fentanyl 2 µg/kg. General anaesthesia were induced with propofol2mg/kg and tracheal intubation were facilitated by administration of cisatracurium 0.1 mg/kg. Anaesthesia were maintained with isoflurane 1.2 MAC, cis-atracurium 0.02 mg/kg every 30 minutes and fentanyl 1µg/kg/h as a bolus dose. Intraabdominal pressure was restricted to ≤12 cm H2O during surgery.

Parameters of measurements:

The primary outcome measured in this study was the pain score at 0, 2, 4, 6 and 12 hours after surgery. Pain scores were measured using a 10 cm visual analogue scale (VAS), The VAS consisted of a 10 cm scale representing varying intensity of pain from 0 cm (no pain) to 10 cm (worst imaginable pain) Patients requiring additional analgesia NSAIDs (diclofenac sodium 75mg) were added if VAS score more than 4 (according to basal HR & BP). Secondary outcomes included analgesic requirements of patients measured as 1st time of order, the amount of analgesic consumed and frequency of analgesic requirements. Other outcomes measures: Demographic data (age, BMI, ASA physical status), Hemodynamic (HR, MAP, Sao2) at different time interval: Before irrigation of gall bladder bed, After irrigation and at 0,2,4,6,12 hours post-operative, nausea, vomiting and shoulder pain.

Statistical Analysis:

Data were collected, revised, coded and entered to the statistical analysis for social science (SPSS) version 23. The quantitative data will presented as mean, standard deviations and ranges while qualitative data will presented as numbers and percentages. The suitable test for comparison between the two studied groups was used according to the type of data (parametric or non-parametric). The confidence interval will set to 95% and the margin of error accepted will set to 5%. So, the p-value will considered significant at the level of < 0.05.

3. Results

They were totally 29 male, 31 female with mean age, BMI 47.10 ± 8.31years, 27.0 ± 5.77kg /m^2 in group H, and 49.23 ± 7.51 years, 28.0 ± 5.57 kg /m^2 in group L.

Statistical differences between both groups regards heart rate after irrigation, pre and postoperative at 2, 4, 6 & 12 hrs, also mean arterial blood pressure pre and postoperative at 2,12 hrs, but was non-significant regards oxygen saturation (P>0.05).

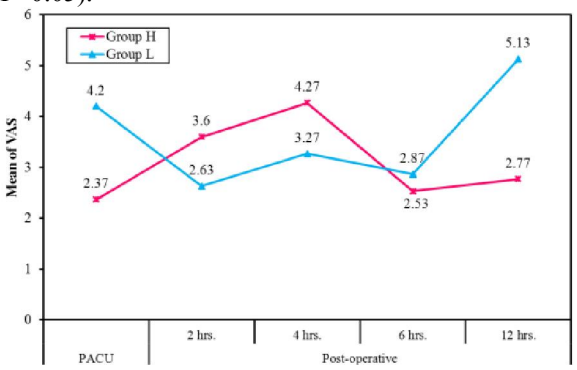

Figure 1: Comparison between groups according to VAS of pain

Postoperatively the patients were assessed for pain utilizing visual analogue scale (VAS) assessed at 0,2,4,6 and 12 hrs. The VAS was higher in L Group as compared to H Group at PACU and 12 hrs postoperative and this difference was statistically significant (P<0.001). At 2th and 4th hour the VAS was higher in H Group as compared to L Group. At 6

hrs VAS was comparable between the two groups (p=0.113) (Table 1, Figure 1).

The average analgesic requirement was lower in the H group with statistical significance between groups (Table 1, Figure 1).

Table 1: Comparison between groups according to VAS of pain

VAS	Group H (n = 30)	Group L (n = 30)	^{U}p
PACU	2.37 ± 0.85	4.20 ± 0.66	<0.001*
Post-operative			
2 hrs.	3.60 ± 1.07	2.63 ± 0.72	<0.001*
4 hrs.	4.27 ± 1.26	3.27 ± 0.64	0.001*
6 hrs.	2.53 ± 0.68	2.87 ± 0.78	0.113
12 hrs.	2.77 ± 0.77	5.13 ± 0.68	<0.001*

Table 2 Comparison between groups according to amount of analgesia

	Group H (n = 30)	Group L (n = 30)	^{t}p
Amount of analgesia (diclofenac 75 mg)	77.50 ± 13.69	137.50 ± 28.43	**<0.001**

Postoperatively the patients were assessed for shoulder pain at 0, 2,4,6 and 12 hrs. Postoperatively, the number of patients having shoulder pain was higher in L group than H group (9 vs 8) however this difference was not statistically significant. (p=0.774) as showed in Table (2) and Figure (2).

Table 3: Comparison between groups according to shoulder pain

Shoulder pain	Group H (n = 30)		Group L (n = 30)		χ^2p
	No.	%	No.	%	
No	22	73.3	21	70.0	0.774
Yes	8	26.7	9	30.0	

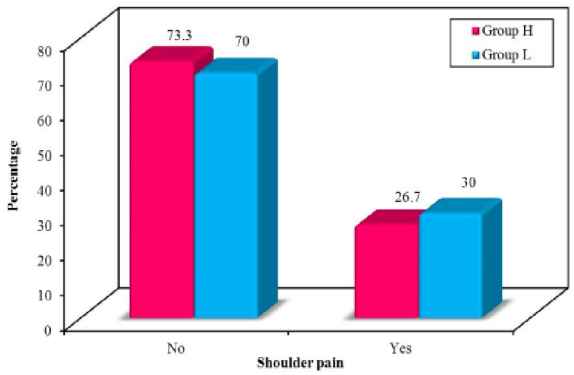

Figure 2. Comparison between groups according to shoulder pain

4. Discussion

Laparoscopic cholecystectomy is one of the most frequently performed elective surgeries. It is a short stay procedure, and therefore, adequate postoperative pain relief is of considerable importance, which makes it ideal for patients. Postoperative pain in these patients is observed in peaks immediately after surgery and decreases after 24 postoperative hours. The cause of early postoperative pain in laparoscopic cholecystectomy is not clearly understood. [**2]**

Our results showed that there was no statistical difference between both groups regarding age, BMI and gender (P> 0.05), This was in harmony with results of **Sharan et al., [9]** found that no statistical significant difference between studied groups regarding age, sex and while our results of vital data showed statistical differences between both groups regards heart rate after irrigation, pre and postoperative at 2, 4, 6 & 12 hrs, also mean arterial blood pressure pre and postoperative at 2,12 hrs (P< 0.05). This was in contrast to results of **Sharan et al., [9]** who found that systolic blood pressure, and diastolic blood pressure were comparatively lower in Group B than in Group A but was of no significance. (P> 0.05), mean heart rate readings were lower in Group B in comparison to Group A. The results were comparable and the difference was found to be significant in the two groups at 2, 4, 6, and 8 h. These results were in concordance with a study done by **Babu et al.,** [**10**] where the vital parameters such as heart rate, blood pressure, and saturation were comparable between the groups but non-significant Similarly, **Devalkar and Salgaonkar** [**11**] found that in postoperative period, mean arterial pressure in both groups showed statistically significant difference (P < 0.01) heart rate was lower in the group which received 0.25% bupivacaine, with statistically significant difference at 0, 2, 4, and 8 h (P <0.01). In another study done by **Meena et al.,** [**12**] comparing

bupivacaine and ropivacaine, heart rate readings were lower and statistically significant in ropivacaine group from the 1st to 9th h. (P<0.05).

Our results showed that there was non-significant statistical difference between groups regards oxygen saturation neither pre and postoperatively nor before & after irrigation (P>0.05). This was in agreement with results of **Sharan et al.,** [**9**] who reported that no significant difference was found in respiratory rate and SpO2 (P>0.05).

The present study results showed that there was a significant decrease in amount of analgesia in Group H in comparison to Group L (P <0.001), also the need for 1st order analgesia at 1,2,4 and 6 hours was statistically significant between both groups (P<0.001). In **Sharan et al.,** [**9**] study, the number of patients requiring rescue analgesia was lower in Group B in comparison to Group A. The readings were comparable and the difference, however, was found to be non-significant in the two groups. **Kim et al.** [**13**] compared ropivacaine with normal saline and showed better analgesia with ropivacaine. Also, **Sharan et al., [9]** reported that the time to first analgesic requirement was compared in both the groups and was found to be lower in Group A. A study was conducted by **Kucuk et al. [14**] which showed that the intraperitoneal instillation of (100 mg bupivacaine, 100 mg ropivacaine, or 150 mg ropivacaine at the end of a LC) significantly reduced the morphine consumption during the first 24 h after surgery. These results were also supported by **Trikoupi et al. [15]**

Intraperitoneal instillation of local anasthetics has a bimodal mechanism to pain reduction. It blocks visceral nociception from the peritoneum locally as well as a having a systemic effect after absorption through the peritoneal surface [**2**]. The systemic analgesic effect of local anasthetics is induced through an anti-inflammatory effect by peripheral suppression of acute chemically induced pain inhibition of nerve conduction, as well as having a central anti-hyperalgesic effect. The systemic effect of Intraperitoneal instillation of local anastheics comes from absorption of LA through the peritoneal surface. Intraperitoneal instillation of local anastheics produce increased plasma levels short after administration. **Kahokehr et al., [16].**

The results of our study showed that there was no statistical difference between groups regarding shoulder pain (P=0.774). Results of **Donatsky et al., [17]** systematic review reported that both IPI administration of saline and LA solutions can be used to reduce shoulder pain severity after laparoscopic cholecystectomy.

Our results showed that there was no statistical difference between both groups regarding complication like nausea and vomiting (P>0.05). Results of **Sharan et al., [9]** reported that complications were noted in <15% of the patients in both the groups. Nausea and vomiting were seen in four patients in Group A and three patients in Group B.

There is plenty of evidence in literature regarding analgesic efficacy of intraperitoneal infiltration of bupivacaine in the dose ranging 50–200 mg in volumes ranging from 10–100 m **Moiniche et al., [18].** The present study results of VAS score showed that there was statistical difference between both groups in PACU, postoperative at 2, 4, 12hrs (P <0.05). results of **Sharan et al., [9**] showed that the mean VAS score readings were lower in Group B in comparison to Group A and were statistically significant at 4, 6, and 8 h. **Devalkar and Salgaonkar [11]** found mean VAS score readings to be lower in Bupivacaine group as compared to Normal saline group and were statistically significant at 2, 4, 8, and 12 h. Similarly, **Meena et al. [12**] in their study found that mean VAS score was lower in both the groups with significant difference between the VAS score from the 5th postoperative h to 12th h except in the 6th h. The results were also in concordance with studies done by **Rapolu et al. [19]** and **Shivhare et al. [20]**

Conclusion

This study demonstrates that irrigation with higher concentration & lower volume of bupivacaine at the surgical bed in laparoscopic cholecystectomy will significantly lower the intensity of postoperative visceral pain, as well as analgesic consumption in the first postsurgical hours. Because of this, we can establish this protocol for use in laparoscopic cholecystectomies with the purpose of a faster return of the patient to his or her normal life, and thus, a shorter hospital stay. Also, Intra-perotenial irrigation with high volume low concentration bupivacaine significantly increased duration of anasthesia and reduced opioid requirement after LC. it was significantly diminished total abdominal pain, complete elimination of shoulder tip pain, and decreased analgesia request and analgesic consumption. Finally, bupivacaine at the dosage used were very safe and had no significant side effects. Therefore, we can reduce pain in patients who undergo laparoscopic cholecystectomy in ambulatory centres. This practice can become permanent in these cases.

Conflict of interest

We declare that we have no conflict of interest.

References

1. Lau H, Brooks DC. Predictive factors for unanticipated admissions after ambulatory

laparoscopic cholecystectomy. Arch Surg. 2001;136:1150–1153.
2. Castillo-Garza, G., Díaz-Elizondo, J. A., Cuello-García, C. A., & Villegas-Cabello, O. (2012). Irrigation with bupivacaine at the surgical bed for postoperative pain relief after laparoscopic cholecystectomy. JSLS: Journal of the Society of Laparoendoscopic Surgeons, 16(1), 105.
3. Callesen T, Klarskov B, Mogensen, et al. Day case laparoscopic cholecystectomy: feasibility and convalescence. Ugeskr Laeger. 1998;160:2095–2100.
4. Bisgaard T, Kehlet H, Rosenberg J. Pain and convalescence after laparoscopic cholecystectomy. Ann R Coll Surg Engl. 2001;167:84–96.
5. David CW. Analgesic treatment after laparoscopic cholecystectomy. Anesthesiology. 2006;104:835–846.
6. Gordon S. Intraperitoneal ropivacaine and saline were similar in preventing pain after extensive laparoscopic excision of endometriosis. J Am Assoc Gynecol Laparosc. 2002;9:29–34.
7. Ahmed B, Ahmed A, Tan D, et al. Post-laparoscopic cholecystectomy pain: effects of intraperitoneal local anesthetics on pain control–a randomized prospective double-blind placebo-controlled trial. Am Surg. 2008;74:201–9.
8. Lepner U, Goroshina J, Samarutel J. Postoperative pain relief after laparoscopic cholecystectomy: a randomised prospective double-blind clinical trial. Scand J Surg. 2003;92:121–124.
9. Sharan, R., Singh, M., Kataria, A. P., Jyoti, K., Jarewal, V., & Kadian, R. (2018). Intraperitoneal instillation of bupivacaine and ropivacaine for postoperative analgesia in laparoscopic cholecystectomy. Anesthesia, essays and researches, 12(2), 377.
10. Babu R, Jain P, Sherif L. Intraperitoneal instillation: Ropivacaine vs. bupivacaine for post operative pain relief in laparoscopic cholecystectomy. Int J Health Sci Res. 2013;3:42–7.
11. Devalkar PS, Salgaonkar SV. Intraperitoneal instillation of 0.25% bupivacaine for laparoscopic cholecystectomy: Effect on postoperative pain. IJCMAAS. 2016;12:91–5.
12. Meena RK, Meena K, Loha S, Prakash S. A comparative study of intraperitoneal ropivacaine and bupivacaine for postoperative analgesia in laparoscopic cholecystectomy: A randomized controlled trial. Anaesth Pain Intensive Care. 2016;20:295–300.
13. Kim TH, Kang H, Park JS, Chang IT, Park SG. Intraperitoneal ropivacaine instillation for postoperative pain relief after laparoscopic cholecystectomy. J Korean Surg Soc. 2010;79:130–6.
14. Kucuk C, Kadiogullari N, Canoler O, Savli S. A placebo-controlled comparison of bupivacaine and ropivacaine instillation for preventing postoperative pain after laparoscopic cholecystectomy. Surg Today. 2007;37:396–400.
15. Trikoupi A, Papavramidis T, Kyurdzhieva E, Kesisoglou I, Vasilakos D. Intraperitoneal administration of ropivacaine during laparoscopic cholecystectomy. Eur J Anaesth. 2010;27:222.
16. Kahokehr A, Sammour T, Soop M, Hill AG (2010) Intraperitoneal use of local anesthetic in laparoscopic cholecystectomy: systematic review and metaanalysis of randomized controlled trials. J Hepatobiliary Pancreat Sci 17:637–656.
17. Donatsky AM, Bjerrum F and Gögenur I. (2013) Intraperitoneal instillation of saline and local anesthesia for prevention of shoulder pain after laparoscopic cholecystectomy: a systematic review. Surgical endoscopy 27: 2283-2292.
18. Moiniche S, Jorgensen H, Wetterslev J, Berg J. Local anaesthetic infiltration for postoperative pain relief after laparoscopy: a qualitative and quantitative systematic review of intraperitoneal, port-site infiltration and mesosalpinx block. Anaesth Analg. 2000;90:899–912.
19. Rapolu S, Kumar KA, Aasim SA. A comparative study on intraperitoneal bupivacaine alone or with dexmedetomidine for post-operative analgesia following laparoscopic cholecystectomy. IAIM. 2016;3:33–40.
20. Shivhare P, Dugg P, Singh H, Mittal S, Kumar A, Munghate A. A prospective randomized trial to study the effect of intraperitoneal instillation of ropivacaine in postoperative pain reduction in laparoscopic cholecystectomy. J Minim Invasive Surg Sci. 2014;3:e18009.

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