

Original Research Article


Effect of irrigation of gall bladder bed and trocar sites with bupivacaine in management of post-operative pain in patients undergoing laparoscopic cholecystectomy in tertiary care centre

Abraham Jebakumar R¹, Sathish Kumar D^{2*}

¹Associate Professor, ²Senior Resident

Department of General Surgery, Dharmapuri Medical College, Tamil Nadu, India

*Corresponding author email: sathishkumarsk007@gmail.com

	International Archives of Integrated Medicine, Vol. 7, Issue 10, October, 2020.	
	Available online at http://iaimjournal.com/	
	ISSN: 2394-0026 (P)	ISSN: 2394-0034 (O)
	Received on: 20-09-2020	Accepted on: 03-10-2020
	Source of support: Nil	Conflict of interest: None declared.
How to cite this article: Abraham Jebakumar R, Sathish Kumar D. Effect of irrigation of gall bladder bed and trocar sites with bupivacaine in management of post-operative pain in patients undergoing laparoscopic cholecystectomy in tertiary care centre. IAIM, 2020; 7(10): 106-113.		

Abstract

Background: Laparoscopic cholecystectomy is the gold standard treatment for benign gallbladder disease. It is characterized by a short hospital stay and an quick return to regular activity.

Aim and objective: The aim of this study was to evaluate the use of the irrigation of a local anesthetic, such as bupivacaine, at the surgical bed for post-operative pain reduction.

Materials and methods: During the period of October 2018 to October 2019, 60 patients of age group 15-60 and both sex underwent laparoscopic cholecystectomy who were admitted in the Department of General Surgery, Government Dharmapuri Medical College and Hospital. After obtaining consent from the patient, randomized into two groups of 30 each, after removal of gallbladder 20 ml of normal saline irrigated to control group and 20 ml of 0.25% bupivacaine irrigated to study group. Post-operative pain was calculated from both groups using visual analog scale at 1, 2, 3, 4, 6, 12, 24 hours and compared. Rescue analgesia was given if VAS was more than 5. Rescue analgesia needed for both groups also calculated.

Results: Among these patients the mean age in our study was 36.7 years (control) and 41.1 years (study). The number of females in the study was more compared to that of males in both the groups, the duration of surgery in both groups is comparable, control (94.46 min) and study (93.6 min). Postoperative VAS at different intervals (1, 2, 3, 4, 6, 12, 24 hours) was found to be statistically

significant in study group. Out of 60 patients, 35 patients needed rescue analgesia, of them 25 were control group and 10 were study group.

Conclusion: In conclusion, irrigation with bupivacaine in the surgical bed in laparoscopic cholecystectomy will significantly lower the intensity of postoperative visceral pain, as well as the analgesic consumption in the initial postsurgical hours. Therefore, we can establish this protocol for use in laparoscopic cholecystectomies with the purpose of faster return of the patient to their normal life, and thus, a shorter hospital stay.

Key words

Cholecystectomy, Laparoscopic, Bupivacaine, Intraperitoneal instillation, Post-operative pain.

Introduction

Laparoscopic cholecystectomy is the gold standard treatment for benign gallbladder disease [1]. It is characterized by a short hospital stay and quick return to regular activity. Strategies to manage the different intra-abdominal surgical pathologies with a laparoscopic approach offer a significant advantage compared with the conventional technique. Laparoscopic cholecystectomy, surgical outcome in terms of reduced pain and convalescence compared to conventional cholecystectomy [2]. However, the post-operative pain is significant. Pain management with multiple analgesic and opioids has been reported with variable success.

The pain in the open 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). In 17% to 41% of the patients, pain being the main cause for staying overnight in the hospital the day of surgery 2–7 and the primary reason why the patients have a longer convalescence [3]. Because postoperative pain after laparoscopic surgery is complex mechanism, specialists suggest that effective analgesic treatment should be a multimodal support. It should also include blocking the sensitive afferents (infiltrating the skin with a local anesthetic before any incision), irrigating a local anesthetic in the peritoneal cavity, providing the patient with fluids and electrolytes.

Materials and methods

Inclusion criteria

- Patients undergoing elective laparoscopic cholecystectomy,
- ASA I or II physical status,
- Age 15-60 years.

Exclusion criteria

- Patients undergoing emergency laparoscopic cholecystectomy
- ASA III or IV Physical status
- Age <15 and >60
- Those who cannot understand VAS.

Sample size - 60

Control group (A) - 30 (Those who receive only trocar site bupivacaine)

Study group (B) - 30 (Those who receive both trocar site and gallbladder bed bupivacaine)

Patients and methods

Written informed consent was taken from all subjects before enrolment in the study. Knowledge about VAS to all patients was given. Randomization of the patients into two groups of 30 patients each, control and study group was done. In this study, all patients were underwent standard operative method with a 4-trocar technique and achieve pneumoperitoneum with use of Veress needle through a periumbilical incision and maintain at 14mm Hg during entire surgical procedure.

After removal of gallbladder, secure hemostasis at the surgical bed was done. Insertion of feeding

tube through right subcoastal port and irrigate surgical bed with 20 ml of normal saline in control group and 20 ml of 0.25% (50 mg) bupivacaine in study group was done. Patient was kept in Trendelenburg position with right lateral tilt to facilitate dispersion of drug solution in the sub-hepatic region for 5 minutes, then remove gas, instruments and trocars. DT is not used in both control and study groups. Injection of 20 ml of 0.25% bupivacaine was given subcutaneously to trocar sites for all patients. Post-operative pain using VAS scale at 1, 2, 3, 4, 6, 12 and 24 hours in the post-operative ward was done. If patient experiences pain equal to or more than 5 in VAS scale, give inj. Tramadol 2 mg/kg. The length of time between extubation and the first request of analgesia to be noted-Rescue Analgesia Needed. To compare the post-operative pain between two groups at different time intervals

Results

Statistical analysis was performed using the Microsoft (MS) Office Excel Software (Microsoft Excel, Redmond, Washington: Microsoft, Computer software). Results were expressed as mean, variance, number and percentage (%). Data were analyzed using post-hoc analysis method.

Normally, distributed data were assessed using unpaired student's t-test (for comparison of parameters among groups). Comparison was carried out using Chi-square test with a P value reported at 95% confidence level. Level of significance used was P= 0.05.

Cholelithiasis was characteristically a disease of middle-aged. The mean age in our study was 36.7 years (control) and 41.1 years (study) as per **Figure - 1**.

The number of females in the study was more compared to that of males in both the groups; overall this may be explained by the fact that the disease has a female preponderance (**Figure – 2**).

Figure – 1: Age distribution.



The duration of surgery in both groups was comparable, control (94.46 mins) and study (93.6 mins) indicates that there was no delay in surgery because of instillation of bupivacaine intraperitoneally (**Figure – 3**).

Post-operative VAS at different intervals

The post-operative pain measured by visual analog scale at 1 hour showed mean value of 3.5 (control) and 2.3 (study), variance of 0.32 (control) and 0.35 (study), p-value of <0.05 which was significant.

The post-operative pain measured by visual analog scale at 2 hours showed mean value of 3.7 (control) and 2.4 (study), variance of 0.4 (control) and 0.31(study), p-value of <0.05 which was significant.

The post-operative pain measured by visual analog scale at 3 hours showed mean value of 4 (control) and 2.6 (study), variance of 0.44 (control) and 0.36 (study), p-value of <0.05 which was significant.

The post-operative pain measured by visual analog scale at 4 hours showed mean value of 4.2 (control) and 2.9 (study), variance of 0.57 (control) and 1.06 (study), p-value of <0.05 which was significant.

The post-operative pain measured by visual analog scale at 6 hours showed mean value of 5.1

(control) and 3.2 (study), variance of 0.71 (control) and 2.18 (study), p-value of <0.05 which was significant.

The post-operative pain measured by visual analog scale at 12 hours showed mean value of 4.4 (control) and 3.2 (study), variance of 0.59 (control) and 1.47 (study), p-value of <0.05 which was significant.

Figure – 2: Gender distribution.

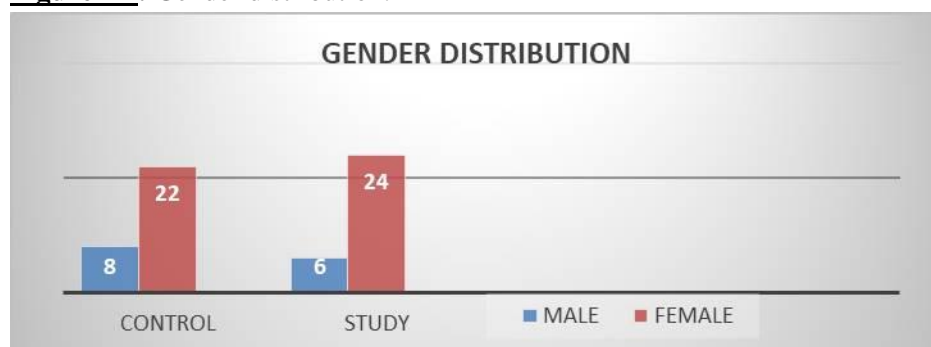
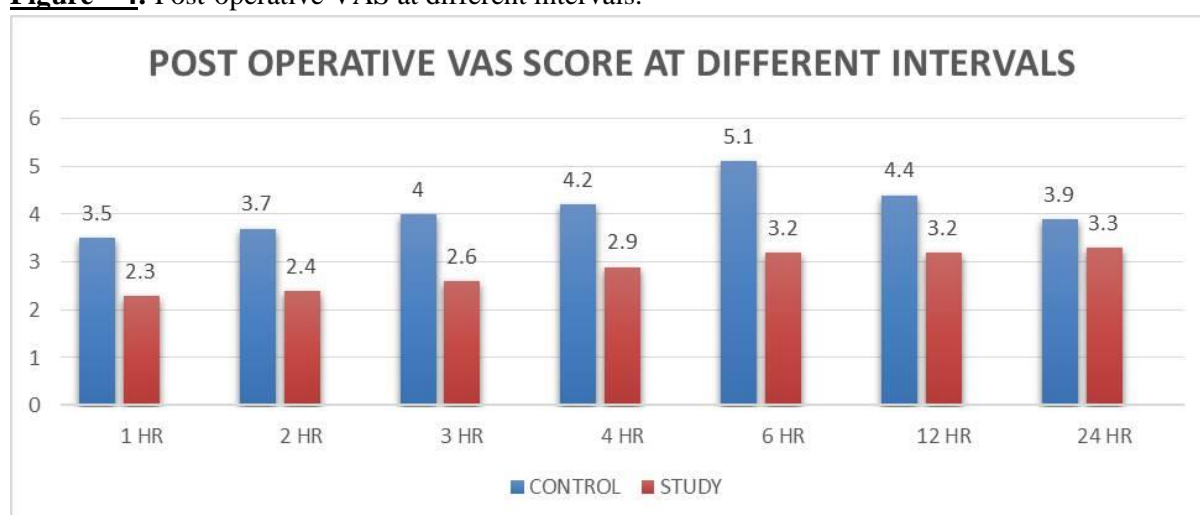


Figure – 3: Duration of surgery.



Figure – 4: Post-operative VAS at different intervals.



The post-operative pain measured by visual analog scale at 24 hours showed mean value of 3.9 (control) and 3.3 (study), variance of 0.75 (control) and 0.79 (study), p-value of <0.05 which was significant (**Figure – 4**).

From the **Table – 1**, it was clear that in our study group patients had decreased post-operative pain when compared to control group which was statistically significant.

Table – 1: Hour wise post-operative pain in case and control

Mean	1 HR	2 HR	3 HR	4 HR	6 HR	12 HR	24 HR
Control	3.5	3.7	4	4.2	5.1	4.4	3.9
Study	2.3	2.4	2.6	2.9	3.2	3.2	3.3
Variance							
Control	0.32	0.40	0.44	0.57	0.71	0.59	0.75
Study	0.35	0.31	0.36	1.06	2.18	1.47	0.79
P-value	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.015
Remarks	<i>Significant</i>	<i>Significant</i>	<i>Significant</i>	<i>Significant</i>	<i>Significant</i>	<i>Significant</i>	<i>Significant</i>

Figure – 5: Rescue analgesia needed.



Rescue analgesia needed

Out of 60 patients, 35 patients needed rescue analgesia, of them 25 were control group and 10 were study group (**Figure – 5**).

Discussion

Laparoscopic cholecystectomy is a part of day case surgery hence adequate analgesia and early recovery is of utmost importance [4]. Post-operative pain is the most common complications of laparoscopic surgery [5]. The pain is to the maximum within 6 hour of the procedure then it gradually decreases over a couple of days, but it varies considerably between patients [12].

The peritoneum is the serous membrane that covers the abdominal cavity and most of the intra-abdominal organs [6]. It is a very thin layer highly vulnerable to damage and it is not designed to cope with variable conditions such as the dry and cold carbon dioxide. During laparoscopic surgery, postoperative pain is multifactorial in origin, can be somatic pain at port site (port site pain) and visceral pain which is caused by residual carbon dioxide in the

peritoneal cavity [7]. Visceral pain is mainly due to stretching of the visceral peritoneum and peritoneal inflammation and phrenic nerve irritation [13].

The accurate pain assessment is difficult because of its individual threshold, subjectivity, and difficulty in measurement [8, 9]. In this study we compared the post-operative pain relief in laparoscopic cholecystectomy cases using intra peritoneal Bupivacaine 0.5% and saline [10, 11] and found that IP administration of Inj. bupivacaine in LC is a safe method and offers significant pain relief and significant decrease in requirement of analgesics [14].

The main advantage of using local anesthetics is that they do not have the adverse effects of opioids, which may delay recovery and discharge from hospital. These effects include post-operative nausea, sedation, impairment of return of gastrointestinal motility, and pruritus. In addition, time to return of bowel function in the post-operative period may be reduced when the use of opioids is obviated by administering local anesthetics [15, 16].

In the present study, majority of the patients were in the middle age group. The mean age in our study was 36.7 years (control) and 41.1 years (study) because of the prevalence of the disease in middle age group.

The number of females in the study was more compared to that of males in both groups; overall this may be explained by the fact that the disease has a female preponderance. Cholelithiasis is characteristically a disease of middle-aged women. In a study by Novacek showed that female gender is the most important risk factors and the rates of gallstones are two to three times higher among women than men which correlate with the present study [17].

The duration of surgery in both groups is comparable, control (94.46 min) and study (93.6 min) indicates that there is no delay in surgery because of instillation of bupivacaine intraperitoneally.

In our study there was significant pain relief in the first 24 hours postoperatively by intraperitoneal bupivacaine after taking care of the port site pain by injection bupivacaine with no significant toxicity.

Our study yielded results comparable to a similar study done by Yadava A, et al., where they had found significant decrease in mean pain VAS score by using intraperitoneal bupivacaine and tramadol after LC. In their study they had also added IP magnesium sulphate ($MgSO_4$) to bupivacaine and had concluded that addition of $MgSO_4$, by antagonising N-methyl-D-aspartate (NMDA) receptors and thereby reducing neuronal signaling as well as pain processing in the central nervous system, resulted in longer duration of pain-free period and less consumption of rescue analgesics in postoperative period compared to intraperitoneal instillation of tramadol with bupivacaine [16].

Narchi, et al. in his study found intraperitoneal local anesthetics to be more effective in reducing

pain up to 48 hours postoperatively in patients undergoing diagnostic laparoscopy [19].

Utilizing 20 ml of either 0.25% bupivacaine or 0.5% lignocaine, Rademaker, et al. failed to demonstrate any reduction in postoperative pain. A possible explanation of the failed effect given by them was the instillation of local anesthetics in the supine position prevented its flow over the coeliac plexus and phrenic nerve endings [20].

Keeping in view that the importance of positioning during instilling the local anesthetic Scheinin, et al. administered 100 ml of either 0.15% plain bupivacaine or with adrenaline in head down tilt maintained for 20 minutes. They found no relief in pain after laparoscopic cholecystectomy. The lack of analgesic efficacy can be attributed to the lower concentration of bupivacaine used and more extensive and longer duration of surgery compared to gynecological laparoscopies [15].

The good results of our study may be related to the use of higher concentration of bupivacaine compared to other studies because it is the concentration which may be important in laparoscopic cholecystectomy rather than volume. Also the drug was instilled in trendelenberg position so as to encourage its accumulation in gall bladder bed.

In the present study found that there was a significant difference in the study groups with respect to the time for intake of rescue analgesic consumption. Similar results were obtained by Chundrigar, et al. in their study. Chundrigar, et al. noted pain relief up to 2 hours post op with the intraperitoneal administration of 0.25% Bupivacaine, although in the present study we could note pain relief up to 24 hours post op. This may be due to the fact that we instilled the local anesthetic in the trendelenburg position at the end of surgery which may have resulted in better dispersion of the drug and hence the beneficial effect up to 24 hour post op [18].

Pasqualucci, et al. also noted significant difference in analgesic consumption between the groups up to 24 hours [21].

The results of the present study demonstrate that intraperitoneal instillation of bupivacaine significantly lower the intensity of postoperative pain and produces lower VAS up to 24 hours postoperatively. The post-operative analgesic requirements are also less.

Conclusion

In conclusion, irrigation with bupivacaine in the surgical bed in laparoscopic cholecystectomy will significantly lower the intensity of postoperative visceral pain, as well as the analgesic consumption in the initial postsurgical hours, thereby decreasing the burden both to the patient as well as to the hospital. Therefore, we can establish this protocol for use in laparoscopic cholecystectomies with the purpose of faster return of the patient to their normal life, and thus, a shorter hospital stay. Finally, bupivacaine at the dosage used was very safe and had no significant side effects. Therefore, we can reduce the pain in patients who undergo laparoscopic cholecystectomy in the ambulatory centers.

References

1. Yeo, C. J. Shackelford's surgery of the alimentary tract. Philadelphia, PA, Elsevier/Saunders, 2013.
2. Maingot R., Schwartz S. I., Ellis H., Husser W. C. Maingot's Abdominal operations. Norwalk, Conn, Appleton-Century-Crofts, 1985.
3. Sabiston D. C., Townsend C. M. Sabiston textbook of surgery: the biological basis of modern surgical practice. Philadelphia, PA, Elsevier Saunders, 2012.
4. Brunnicardi F. C., Schwartz S. I. Schwartz's principles of surgery, New York, McGraw-Hill, Health Pub. Division, 2005.
5. Bailey H., Love R. J. M., Russell R. C. G., Williams N. S., Bulstrode C. J. K. Bailey and Love's short practice of surgery. London, Arnold, 2000.
6. Parks R, Welsh F. Gallbladder and biliary surgery. In: Farquharson M, Moran B. Farquharson's Textbook of Operative General surgery, 9th edition, Grain Britian, Hodder Arnold, 2005; p. 322-9.
7. Lord McColl. Laparoscopic cholecystectomy. *Ann R Coll Surg Engl.*, 1992; 74: 231.
8. Bisgaard T, Kehlet H, Rosenberg J. Pain and the convalescence after laparoscopic cholecystectomy. *Eur J Surg.*, 2001; 167: 84-96.
9. Parkhouse J, Lambrachts W, Simpson BRJ. Incidence of postoperative pain. *Br J Anaesth.*, 1961; 33(7): 335-45.
10. Miller RD, Fleisher LA, Roger AJ, Savarese JJ, Wiener-Kronish JP, Young WL. Anesthesia. In: Miller's Anesthesia, 6th edition, Elsevier; 2005, p. 2.
11. Maharjan SK, Shrestha S. Intraperitoneal and periportal injection of bupivacaine for pain after laparoscopic cholecystectomy. *Kathmandu Univ Med J (KUMJ)*, 2009; 7: 50-3.
12. Joris J, Thiry E, Paris P, Weerts J, Lamy M. Pain after laparoscopic cholecystectomy: characteristics and effect of intraperitoneal bupivacaine. *Anesth Analg.*, 1995; 81(2): 379-84.
13. Rees BI, Williams HR. Laparoscopic cholecystectomy: the first 155 patients. *Ann R Coll Surg Engl.*, 1992; 74: 233-6.
14. Scott ADN, Greville AC, McMillan L, Wellwood JMCK. The Laparoscopic laser cholecystectomy: results of technique in 210 patients. *Ann R Coll Surg Engl.*, 1992; 74: 237-41.
15. Scheinin B, Lindgren L. Effect of intraperitoneal bupivacaine on pain after laparoscopic cholecystectomy. *Acta Anaes Scand.*, 1995; 39: 195-8.

Abraham Jebakumar R, Sathish Kumar D. Effect of irrigation of gall bladder bed and trocar sites with bupivacaine in management of post-operative pain in patients undergoing laparoscopic cholecystectomy in tertiary care centre. *IAIM*, 2020; 7(10): 106-113.

16. Yadava A, Rajput SK, Katiyar S, Jain RK. A comparison of intraperitoneal bupivacaine-tramadol with bupivacaine-magnesium sulphate for pain relief after laparoscopic cholecystectomy: A prospective, randomized study. *Indian Journal of Anaesthesia.*, 2016; 60(10): 757-62
17. Novacek G. Gender and gallstone disease. *Wien Med Wochenschr.*, 2006; 156(19-20): 527-33.
18. Chundrigar T, Hedges AR, Morris R, Stamatakis JD. The Intraperitoneal bupivacaine for the effective pain relief after laparoscopic cholecystectomy. *Annals of the Royal College of Surgeons of England*, 1993; 75(6): 437.
19. Narchi P, Benhamou D, Fernandez H. Intraperitoneal local anaesthetic for shoulder pain after the day case laparoscopy. *Lancet*, 1991; 338(8782)(8783): 1569-70.
20. Rademaker BM, Kalkman CJ, Odoom JA, De Wit L, Ringers J. Intraperitoneal local anaesthetics after the laparoscopic cholecystectomy: effects on the postoperative pain, metabolic responses and lung function. *BJA: British Journal of Anaesthesia*, 1994; 72(3): 263-6.
21. Pasqualucci A, De Angelis V, Contardo R, Colo F, Terrosu G, Donini A, et al. Preemptive analgesia, The intraperitoneal local anesthetic in laparoscopic cholecystectomy. *Anesthesiol.*, 1996; 85(1): 11-20.