

## Original Research Article

# Comparison of intraincisional vs intraperitoneal bupivacaine for the control of postoperative pain after laparoscopic cholecystectomy

Umar Qadir Bacha<sup>1\*</sup>, Majid Mushtaque<sup>2</sup>, Sifna Tahir<sup>1</sup>

<sup>1</sup>Department of Anaesthesia, <sup>2</sup>Department of Surgery, SDH Chadoora Budgam, Jammu and Kashmir, India

**Received:** 16 March 2019

**Revised:** 01 April 2019

**Accepted:** 02 April 2019

**\*Correspondence:**

Dr. Umar Qadir Bacha,

E-mail: [umarbacha106@gmail.com](mailto:umarbacha106@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** The aim of this study was to compare the efficacy of infiltration of local anaesthetic bupivacaine at incision site (port site) and intraperitoneally on postoperative pain in patients undergoing laparoscopic cholecystectomy.

**Methods:** This was a randomized controlled study carried out on patients undergoing laparoscopic cholecystectomy. The patients were divided into three groups of 60 patients each. Group 1 was the control group which did not receive either intraincisional or intraperitoneal bupivacaine. Group 2 received intraincisional bupivacaine 0.25% 20 ml, while group 3 received 20 ml solution of bupivacaine 0.25% 20 ml intraperitoneally. Postoperative pain was recorded for 24 hours post-operatively.

**Results:** The incidence of abdominal pain was significantly lower in the group which received intraincisional bupivacaine upto 12 hours postoperatively. Right shoulder pain was low in group receiving intraperitoneal bupivacaine as compared to group 2, but it was not statistically significant.

**Conclusions:** Intraincisional (port site) infiltration of bupivacaine is more effective than intraperitoneal infiltration for postoperative pain relief after laparoscopic cholecystectomy. It is easier to apply and there is less requirement of postoperative analgesics.

**Keywords:** Bupivacaine, Postoperative pain, Laparoscopic cholecystectomy, Intraincisional, intraperitoneal

### INTRODUCTION

Laparoscopic interventions have significant advantages over conventional surgery, such as less surgical trauma, shorter hospital stay and faster functional recovery.<sup>1</sup> Laparoscopic cholecystectomy is the most common of these interventions. It has become the main treatment of symptomatic cholelithiasis.<sup>2</sup> The patients mostly suffer from postoperative pain, especially with coughing, respiratory movements and mobilization and shoulder pain secondary to diaphragmatic irritation. This can lead to delayed patient recovery, increased hospital stay and increased morbidity and costs.<sup>3-5</sup> Multimodal analgesia techniques are generally used to relieve pain caused by

laparoscopic cholecystectomy. Non-steroidal anti-inflammatory drugs, epidural analgesia, opioids, incision-site (port site) and intraperitoneal local anaesthetic application are among the multimodal analgesia options.<sup>6-8</sup>

The main reason for using multimodal analgesia techniques is to avoid possible side effects by limiting the utilisation of commonly used opioids to provide postoperative analgesia.<sup>9</sup> So far many studies have been done using intraperitoneal or intraincisional local anaesthetic infiltration, but the results have been conflicting.<sup>10-14</sup> The aim of our study was to compare the

effect of intraincisional vs intraperitoneal bupivacaine on post-operative pain in laparoscopic cholecystectomy.

## METHODS

The present study was conducted as a randomized controlled clinical trial among patients who were subjected to laparoscopic cholecystectomy for symptomatic cholelithiasis at a peripheral Sub-District Hospital of J&K, India between the periods from June 2016 to February 2019. After approval from our hospital ethics committee, a total of 180 patients, classified as American Society of Anesthesiologists I and II (ASA I and II) and aged from 18 to 60 years, were recruited and scheduled for elective laparoscopic cholecystectomy under general anaesthesia. A written and informed consent was signed from all patients before enrolling them in the study.

Patients with known allergic reactions to local anaesthetics were excluded from the study. Also, patients were excluded if they underwent surgery for acute cholecystitis or if the operation had been converted to an open procedure, as well as patients with intraoperative complications. Other exclusion criteria were morbid obesity, chronic medical diseases and chronic opioid treatment.

The patients were randomized prospectively, using a blind envelope system, into three groups of 60 persons each. Group 1 was the control group and did not receive either intraperitoneal or intraincisional bupivacaine. Group 2 was assigned to receive port site infiltration (intraincisional) of 20 ml solution of bupivacaine 0.25% at the end of operation before closure of the wound. Group 3 received 20 ml solution of bupivacaine 0.25% intraperitoneally in the gall bladder bed and under the right copula of the diaphragm at the end of the laparoscopic procedure.

Tab Alprazolam 0.5 mg and Tab Pantoprazole 40 mg were given orally night before surgery. In the operation theatre, intravenous line was established with a 20G cannula and ringer lactate infusion was started at the rate of 60-80 ml/h. Preoperative recording of heart rate, noninvasive blood pressure and arterial oxygen saturation (SpO<sub>2</sub>) was carried out. All patients were premedicated intravenously with midazolam (0.02 mg/kg). After being preoxygenated with 100% oxygen for 3 minutes, patients were induced with intravenous propofol (1%) in dose of 2 mg/kg followed by atracurium 0.5 mg/kg to facilitate the laryngoscopy and tracheal intubation. In addition to above mentioned monitoring end tidal carbon dioxide (ETCO<sub>2</sub>) monitoring was done intraoperatively. Anaesthesia was maintained with isoflurane, nitrous oxide 60% in oxygen, and atracurium in incremental dosages of 0.02 mg/kg when needed.

Laparoscopic cholecystectomy was done using four standard ports at conventional sites. A few minutes

before the completion of surgery, ondansetron 0.1mg/kg intravenously was given to the patients for prevention of PONV. At the conclusion of surgery residual muscle paralysis was reversed with neostigmine 50 µg/kg and glycopyrrolate 10 µg/kg intravenously. The patients were extubated following return of regular, rhythmic respiration when reasonably awake, after a gentle oral suction. Patients were transferred to post anaesthesia care unit for monitoring.

For intraincisional infiltration of bupivacaine, the fascia, muscle and pre-peritoneal space were infiltrated using 5 ml for each port (infiltration of four trocar sites, thus using a total of 20 ml solution). For intra-peritoneal instillation, the solution was instilled in the gall bladder bed and under the right diaphragm following the removal of the gallbladder. This was done using a catheter inserted through the right subcostal port. A small 14 Fr tube drain was placed in sub-hepatic region in all the patients.

All patients received analgesics to a standard postoperative protocol with diclofenac 75 mg intravenous infusion towards the end of the operation and further 50 mg per oral route twice a day. Tramadol 50mg intravenous infusion, as a rescue analgesic, was administered when the visual analogue scale (VAS) score was more than 4. The number of patients requiring rescue analgesia was recorded in each group.

Patients were evaluated for 24 hours post-operatively. Pain intensity was measured based on a 10-point visual analogue scale (VAS; 0-10 cm; 0=no pain and 10=worst imaginable pain) at 30 minutes, 1 hour, 3 hours, 6 hours, 12 hours and 24 hours post-operatively. The number of patients experiencing right shoulder pain in each group was recorded. The occurrence of postoperative nausea and vomiting (PONV) was also recorded among the groups.

## Statistical analysis

Data was expressed as mean and percentage. Parametric data were compared between groups by analysis of variance (ANOVA). Student t-test and chi-square method were used for continuous and discrete variables, respectively. A two-sided probability value (p value) less than 0.05 was considered statistically significant.

## RESULTS

There was no statistically significant difference among the groups in terms of the demographic characteristics ( $p>0.05$ ). The mean duration of surgery was insignificantly different among the three groups (Table 1).

Postoperative abdominal pain was significantly lower in group 2 (group receiving intraincisional bupivacaine) than both group 1 and group 3. This difference was

reported from 30 minutes till 12 hours postoperatively. Although pain scores are less in group 3 when compared with the control group, yet it is not statistically

significant. However at 24 hours post operatively, there was not much statistically significant difference between the three groups (Table 2).

**Table 1: Demographic characteristics.**

Characteristics	Group 1 (n=60)	Group 2 (n=60)	Group 3 (n=60)	P value
<b>Sex ratio</b>				
Male N (%)	30 (50)	24 (40)	27 (45)	0.5534
Female N (%)	30 (50)	36 (60)	33 (55)	
<b>Mean age (years)</b>	42.1	40.1	38.5	0.7527
<b>Mean weight (kg)</b>	63.1	61.5	62.8	0.8551
<b>Mean duration of surgery (min)</b>	54.5	56.4	57.3	0.6783

(P<0.05: Significant)

**Table 2: Mean postoperative pain VAS (visual analogue scale) score.**

Time	Group 1 (n=60)	Group 2 (n=60)	Group 3 (n=60)	P value
<b>30 min.</b>	2.9 *	2.1	2.4	<0.026
<b>1 hr</b>	3.0 *	1.8	2.7 *	<0.001
<b>3 hrs</b>	3.6 *	1.6	3.5 *	<0.001
<b>6 hrs</b>	2.8 *	1.5	2.7 *	<0.001
<b>12 hrs</b>	2.3 *	1.4	2.2 *	<0.001
<b>24 hrs</b>	1.5	1.1	1.2	0.5431

\*Statistically significant difference vs. Group 2. (P<0.05: Significant)

**Table 3: Incidence of right shoulder pain, requirement of rescue analgesia and incidence of PONV between three groups.**

	Group 1 (n=60)	Group 2 (n=60)	Group 3 (n=60)	P value
	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>	
<b>Right shoulder pain</b>	44 (73.3)	15 (25)*	11 (18.3)*	0.029
<b>Rescue analgesia</b>	53 (88.3)#	29 (48.3)	41 (68.3)	0.036
<b>PONV</b>	32 (53.3)	18 (30)	24 (40)	0.065

\*Statistically significant difference vs control group (Group 1), #Statistically significant difference vs Group 2. (P<0.05: Significant)

While no statistically significant difference was found among the groups in terms of frequency of PONV, there was statistically significant lower incidence of right shoulder pain in both groups 2 and 3 as compared to control group. Although statistically insignificant, shoulder pain was less in group 3 than group 2. The requirement of rescue analgesia was significantly lower in patients of group 2 compared to control group only (Table 3).

**DISCUSSION**

Laparoscopic cholecystectomy is superior to open cholecystectomy in terms of postoperative analgesia. However, patients continue to have moderate to severe pain. Pain after laparoscopy is quite different from that after laparotomy. While patients primarily experience parietal type pain (abdominal wall) after laparotomy, patients complain of visceral pain after laparoscopic

operations. Many studies have shown that pain after laparoscopic cholecystectomy arises from different components such as parietal, visceral and shoulder pain with different intensities and time.<sup>15-17</sup> Parietal type pain observed after laparoscopic cholecystectomy is a sudden onset, well-localized and sharp pain. Previous studies have shown that local anaesthetic infiltration into the incision site significantly reduces the analgesic requirement and parietal pain in the postoperative period.<sup>18,19</sup> Visceral pain observed after laparoscopic cholecystectomy is a blunt, diffuse and midline pain that grows slowly, cannot be easily localized and spreads to the reflection areas. Chemical irritants, sudden stretching of organs, excessive contractions and reduced blood flow can be considered among the causes of visceral pain. Reflected pain (shoulder pain) can be experienced in a place different from the stimulus site. The irritation of the diaphragmatic muscle and phrenic nerve with CO2 gas and exposure to the pressure manifests as postoperative

shoulder pain.<sup>20</sup> A large number of studies have examined the intraperitoneal administration of local anaesthetics in laparoscopic cholecystectomies with regard to postoperative pain and narcotic analgesic consumption with promising results.<sup>10,21-23</sup> However, there are other studies also which show that the post-operative analgesia and narcotic usage was not significantly different in the groups that received local anaesthesia.<sup>24-26</sup>

The timing of the administration of the local anaesthetic during surgery has also been debated. Whereas some studies are of the view that the timing of intraperitoneal administration of the local anaesthetic is crucial, other studies have shown that there is no statistical difference regarding the time of discharge and the timing of administering local anaesthetics.<sup>22-29</sup>

In the present study, we compared intraincisional (port site) vs intraperitoneal infiltration of local anaesthetic bupivacaine 0.25%. We found intraincisional infiltration of bupivacaine to be more effective than intraperitoneal route in controlling postoperative abdominal pain. It also decreased the postoperative analgesic requirement.

Our results are consistent with that of Lepner et al and El-labban et al who have compared both intraincisional and intraperitoneal infiltration of local anaesthetic.<sup>24,30</sup> These results have reported significantly more reduction of post-operative abdominal pain with intraincisional local infiltration of the anaesthetic drug.

However there are also few studies which have not shown any post-operative pain reduction with intraperitoneal bupivacaine after laparoscopic cholecystectomy.<sup>25,26</sup> Others have shown only a decreased incidence of shoulder pain with not much affect on the overall pain.<sup>31</sup> On the contrary, Elhakim et al in their study have shown that intraperitoneal lidocaine reduces effectively both shoulder pain and abdominal pain after laparoscopic cholecystectomy.<sup>32</sup> In our study, post-operative right shoulder pain has been found to be less with patients given intraperitoneal infiltration of bupivacaine than those given intraincisional infiltration, but it was not statistically significant.

A limitation of our study was that a drain was applied in order to identify possible bile leakages. Drain application might have led to loss of local anaesthetic and decreased analgesic effect in patients receiving intraperitoneal bupivacaine.

## CONCLUSION

In conclusion, our study shows that intraincisional (port site) infiltration of bupivacaine is more effective than intraperitoneal infiltration for the control of postoperative pain after laparoscopic cholecystectomy. It is simple to apply and decreases postoperative analgesic requirements. Although it is statistically insignificant, shoulder pain is less with intraperitoneal infiltration.

## ACKNOWLEDGEMENTS

The authors would like to thank our operation theatre and postoperative staff for their encouragement and support.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

- Gadacz TR, Talamini MA. Traditional versus laparoscopic cholecystectomy. *Am J Surg.* 1991;161:336-8.
- Zacks SL, Sandler RS, Rutledge R, Brown RS. A population-based cohort study comparing laparoscopic cholecystectomy and open cholecystectomy. *Am J Gastroenterol.* 2002;97:334-40.
- 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.
- Joris J, Thiry E, Paris P, Weerts J, Lamy M. Pain after laparoscopic cholecystectomy: Characteristics and effect of intraperitoneal bupivacaine. *Anesth Analg.* 1995;81:379-84.
- Lum YW, House MG, Hayanga AJ, Schweitzer M. Postcholecystectomy syndrome in the laparoscopic era. *J Laparoendosc Adv Surg Tech A.* 2006;16:482-5.
- Wilson YG, Rhodes M, Ahmed R, Daugherty M, Cawthorn SJ, Armstrong CP. Intramuscular diclofenac sodium for postoperative analgesia after laparoscopic cholecystectomy: a randomised, controlled trial. *Surg Laparosc Endosc.* 1994;4:340-4.
- Pasqualucci A, Angelis V, Contardo R, Colò F, Terrosu G, Donini A, et al. Preemptive analgesia: intraperitoneal local anesthetic in laparoscopic cholecystectomy. A randomized, double-blind, placebo-controlled study. *Anesthesiology.* 1996;85:11-20.
- Erol DD, Yilmaz S, Polat C, Arikan Y. Efficacy of thoracic epidural analgesia for laparoscopic cholecystectomy. *Adv Ther.* 2008;25:45-52.
- Berkenbosch A, Teppemb J, Olivier CN, Dahan A. Influences of morphine on the ventilatory response to isocapnic hypoxia. *Anesthesiology.* 1997;86:1342-9.
- Louizos AA, Hadzilia SJ, Leandros E, Kouroukli IK, Georgiou LG, Bramis JP. Postoperative pain relief after laparoscopic cholecystectomy: A placebo-controlled double blind randomized trial of preincisional infiltration and intraperitoneal instillation of levobupivacaine 0.25%. *Surg Endosc.* 2005;19:1503-6.

11. Moiniche S, Jorgensen H, Wetterslev J, Dahl JB. Local anesthetic infiltration for postoperative pain relief after laparoscopy: A qualitative and quantitative systematic review of intraperitoneal, port-site infiltration and mesosalpinx block. *Anesth Analg.* 2000;90:899.
12. Labaille T, Mazoit JX, Paqueron X, Franco D, Benhamou D. The clinical efficacy and pharmacokinetics of intraperitoneal ropivacaine for laparoscopic cholecystectomy. *Anesth Analg.* 2002;94:100–5.
13. Papagiannopoulou P, Argiriadou H, Georgiou M, Papaziogas B, Sfyra E, Kanakoudis F. Preincisional local infiltration of levobupivacaine vs ropivacaine for pain control after laparoscopic cholecystectomy. *Surg Endosc.* 2003;17:1961–4.
14. Paulson J, Mellinger J, Baguley W. The use of intraperitoneal bupivacaine to decrease the length stay in elective laparoscopic cholecystectomy patients. *Am Surg.* 2003;69:275–8.
15. Avtan L, Berber E, Avci C. Laparoskopik cerrahide postoperatif analjezi. *Ağrı.* 1996;8:22-5.
16. Bisgaard T, Klarskov B, Kristiansen VB, Callesen T, Schulze S, Kehlet H, et al. Multi-regional local anesthetic infiltration during laparoscopic cholecystectomy in patients receiving prop-hylactic multi-modal analgesia: a randomized, double-blinded, placebo-controlled study. *Anesth Analg.* 1999;89:1017-24.
17. Ure BM, Troidl H, Spangenberger W, Dietrich A, Lefering R, Neugebauer E. Pain after laparoscopic cholecystectomy. Intensity and localization of pain and analysis of predictors in preoperative symptoms and intraoperative events. *Surg Endosc.* 1994;8:90-6.
18. Başgül E, Kaynak Ş, Öcal T, Erçelen Ö, Şahin A. İnsizyon bölgesine bupivacain infiltrasyonunun geniş karın insizyonuna bağlı postoperatif ağrı ve narkotik analjezik gereksinimi üzerine etkisi. *Ağrı.* 1992;4:32-5.
19. Alessandri F, Lijoi D, Mistrangelo E, Nicoletti A, Ragni N. Effect of presurgical local infiltration of levobupivacaine in the surgical field on postsurgical wound pain in laparoscopic gynecological surgery. *Acta Obstet Gynecol Scand.* 2006;85:844-9.
20. Kandil TS, El Hefnawy E. Shoulder pain following laparoscopic cholecystectomy: factors affecting the incidence and severity. *J Laparoendosc Adv Surg Tech A.* 2010;20:677-82.
21. Papadima A, Lagoudianakis E, Antonakis P, Filis K, Makri I, Markogiannakis H, et al. Repeated intraperitoneal instillation of levobupivacaine for the management of pain after laparoscopic cholecystectomy. *Surgery.* 2009;146:475–82.
22. 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.
23. Ahmed BH, Ahmed A, Tan D, Awad ZT, Al-Aali AY, Kilkenny J, 3rd, et al. Post-laparoscopic cholecystectomy pain: Effects of intraperitoneal local anesthetics on pain control—a randomized prospective double-blinded placebo-controlled trial. *Am Surg.* 2008;74:201–9.
24. Lepner U, Goroshina J, Samaritel J. Postoperative pain relief after laparoscopic cholecystectomy: A randomized prospective double-blind clinical trial. *Scand J Surg.* 2003;92:121–4.
25. Zmora O, Stolik-Dollberg O, Bar-Zakai B, Rosin D, Kuriansky J, Shabtai M, et al. Intraperitoneal bupivacaine does not attenuate pain following laparoscopic cholecystectomy. *JLS.* 2000;4:301–4.
26. Elfberg BA, Sjövall-Mjöberg S. Intraperitoneal bupivacaine does not effectively reduce pain after laparoscopic cholecystectomy: A randomized, placebo-controlled and double-blind study. *Surg Laparosc Endosc Percutan Tech.* 2000;10:357–9.
27. Inan A, Sen M, Dener C. Local anesthesia use for laparoscopic cholecystectomy. *World J Surg.* 2004;28:741–4.
28. Lee IO, Kim SH, Kong MH, Lee MK, Kim NS, Choi YS, et al. Pain after laparoscopic cholecystectomy: The effect and timing of incisional and intraperitoneal bupivacaine. *Can J Anaesth.* 2001;48:545–50.
29. Cantore F, Boni L, Di Giuseppe M, Giavarini L, Rovera F, Dionigi G. Pre-incision local infiltration with levobupivacaine reduces pain and analgesic consumption after laparoscopic cholecystectomy: A new device for day-case procedure. *Int J Surg.* 2008;6:S89–92.
30. El-labban GM, Hokkam EN, El-labban MA, Morsy K, Saadl S, Heissam KS. Intra-incisional vs intraperitoneal infiltration of local anaesthetic for controlling early post-laparoscopic cholecystectomy pain. *J Minimal Access Surg.* 2011;7(3):173-7.
31. Cunniffe MG, McAnena OJ, Dar MA, Calleary J, Flynn N. A prospective randomized trial of intraoperative bupivacaine irrigation for management of shoulder-tip pain following laparoscopy. *Am J Surg.* 1998;176:258–61.
32. Elhakim M, Elkott M, Ali NM, Tahoun HM. Intraperitoneal lidocaine for postoperative pain after laparoscopy. *Acta Anaesthesiol Scand.* 2000;44:280.

**Cite this article as:** Bacha UQ, Mushtaque M, Tahir S. Comparison of intra-incisional vs intraperitoneal bupivacaine for the control of postoperative pain after laparoscopic cholecystectomy. *Int Surg J* 2019;6:1509-13.