

Analgesic Effect of Intra Peritoneal and Port Site Instillation of Bupivacaine in Post Laparoscopic Cholecystectomy

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Abstract

Background: Pain in cases of laparoscopy is a distressing side effect mainly in initial post-operative period. This randomized control study is done to evaluate the local effect of Bupivacaine instillation intraperitoneally and at port site. **Subjects and Methods:** Our study is a randomized controlled study of 90 cases of symptomatic cholelithiasis admitted and operated upon during the period of 24 months in the department of general surgery of our institute. The patients were randomly divided into 3 groups, Group A received intraperitoneal instillation of 20 ml of 0.5% Bupivacaine on gall bladder fossa and subdiaphragmatic region. Group B received 10 ml of 0.5% bupivacaine on gall bladder fossa subdiaphragmatic and 10ml at the port site. Group C was the Control group who has not received any local analgesia. Postoperative pain and shoulder tip pain were then compared using Visual Analogue Scale (VAS) and Verbal Rating Scale (VRS). **Results :** At 2 and 4 hours pain score significantly more in Group C compared to Group B and A. After 8 hours there was no difference in pain score in all 3 groups. Time to receive first analgesia is significantly longer in group B compared to other groups. No difference in the shoulder pain in any of the groups. **Conclusion:** The instillation of Bupivacaine at the port site and intra-peritoneally (at the gallbladder fossa and sub-diaphragmatically), significantly decreases the pain in initial post-operative period in laparoscopic cholecystectomy.

Keywords: Laparoscopic cholecystectomy, Bupivacaine, post-operative pain.

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Introduction

Advantages of laparoscopy over open surgery are no more debatable and already well established. The most prominent benefit is about post-operative pain relief and hospital stay, which depends mainly on pain relief. Patients operated for laparoscopic cholecystectomy still complaints of pain which is maximum during first two-three hours and then subsides over next 24 hours. This is the time when it is significantly less compared to open surgery but for first two to three hours patient is a candidate for need of good pain relief. The pain is mainly from

1. Port side (incision pain (parietal pain
2. Due to stretching and inflammation of the peritoneum (visceral pain
3. Shoulder pain (referred pain) due to phrenic nerve irritation that can be multifactorial like CO₂ trapped in

sub-diaphragmatic region between diaphragm and liver stretching and inflammation.^[1]

The severity of pain depends on many factors like patients' pain tolerance level, underlying disease, intra-operative tissue handling, residual CO₂ and intra-operative pressure. Till date, multiple pain control techniques were used including NSAIDS, opioids (may cause sedation, respiratory depression, or emesis), but none of these has proven effective in initial pain relief.^[1] Local infiltration and intra-peritoneal instillation of anesthetics are used in many studies, some of them are favoring and others showed no benefit in pain relief.^[2,3] Intraperitoneal administration of local anaesthesia for visceral blockage is used since 1950 and proved effective in many studies. Since the origin of pain is multifactorial, treatment also should be multifactorial. The objective of this paper is to evaluate and compare the pain relief effect of bupivacaine locally versus intraperitoneal instillation in a patient operated

for laparoscopic cholecystectomy.

Subjects and Methods

Our study was a randomized controlled study where 90 cases of symptomatic cholelithiasis were admitted and operated upon during a period of two years in the department of general surgery of our institute. Prior approval from local ethical comity was obtained. Patients were in the age group of 18 to 70 years. Open cholecystectomy or laparoscopies converted to open surgery were excluded. Drain was not placed in any patient to avoid the possibility of washing out bupivacaine into drains. The patients were allotted groups based on a computer generated randomization table. Group A received intra-peritoneal instillation of 20 ml of 0.5% Bupivacaine on the gall bladder fossa and sub-diaphragmatic region. Group B received intra-peritoneal instillation of 10 ml of 0.5% Bupivacaine on the gall bladder fossa and sub-diaphragmatic region and 10ml of 0.5% Bupivacaine at the port site after the procedure. Group C was the control group who had not received any local analgesia. Postoperative pain and shoulder tip pain was compared on the basis of Visual Analogue Scale (VAS) and 4 grades Verbal Rating Scale (VRS) in all 3 group at 0, 2,4,8,12 and 24 hours. First recording of pain at the postoperative recovery room was taken as “0 hour”. The paper VAS score consisted of a line of 10 cm length with the extreme limits defining as ‘no pain at all’ and ‘pain as bad as it could be. Patient is asked to draw a line depending on the severity of pain and measured in cm. In a VRS, adjectives were used to describe different levels of pain like mild (2), moderate (3), and severe (4). Two endpoints were the same as in VAS (0-no pain and 4- unbearable pain). Thus the score can be in 0 to 4.^[4] Time of receiving first analgesia was also recorded and compared. Once VAS was more than 6 or VRS more than 3, patients received rescue analgesia (Diclofenac injection, 75mg intravenous) and time recorded. P-values were evaluated by One-way analysis of variance (ANOVA) with Post-Hoc Boferroni’s test for multiple group comparisons.

Result

Pain Sore by VAS: [Table 1 and Figure 1]

1. At 2 and 4 hours, pain scores significantly more in Group A compared to Group B
2. At 2 hours, VAS score were significantly more in Group C than in Group B and group A.
3. After 8 hours, there were no difference in pain score amongst all 3 groups.

Pain score by VRS: [Table 2 and Figure 2]

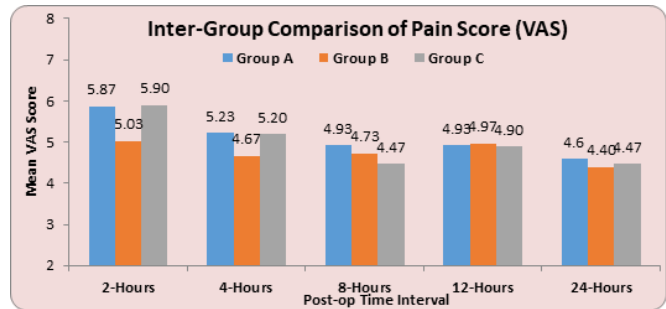


Figure 1: The inter-group comparison of pain score (VAS) (n=90).

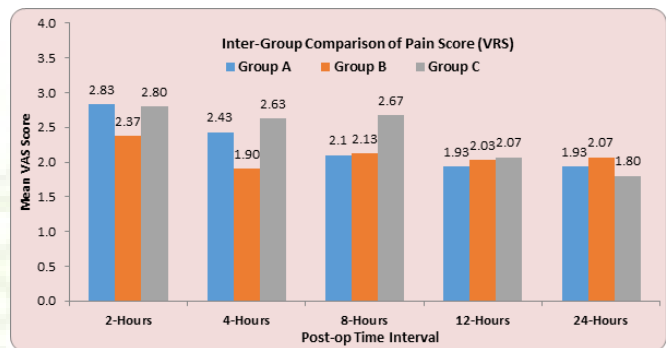


Figure 2: Inter-group comparison of pain score (VRS) (n=90).

1. The mean pain score (VRS) at Post-op 2-Hours were significantly higher in Groups A and C compared to Group B (P-value <0.05 for both).
2. The mean pain score (VRS) at Post-op 4-Hours were significantly higher in Groups A and C compared to Group B (P-value <0.05 for both).
3. The mean pain score (VRS) at Post-op 8-Hours did not differ significantly between Groups A and B (P-value >0.05). The mean pain score (VRS) at Post-op 8-Hours were significantly higher in Group C compared to groups A and B (P-value <0.01 for both).
4. The mean pain score (VRS) at Post-op 12-Hours did not differ significantly across the three study groups (P-value >0.05 for all).

Shoulder Pain: No statistically significant difference in shoulder tip pain in the 3 groups.

Time of First rescue analgesia: The mean +/- standard deviation of time of first rescue analgesia in group A, B and group C was 9.33 +/- 2.19 hours (hrs), 10.50 +/- 3.76 hrs and 6.70 +/- 1.49 hrs respectively.

Table 1: Inter-group comparison of pain score (VAS) (n=90).

Pain Score	Group A [n=30]		Group B		Group C [n=30]		P-value [Inter-Group]		
	Mean	SD	Mean	SD	Mean	SD	Group A v Group B	Group A v Group C	Group B v Group C
2-Hours	5.87	0.78	5.03	1.35	5.90	1.06	0.012*	0.999 ^{NS}	0.008**
4-Hours	5.23	0.73	4.67	1.03	5.20	0.85	0.042*	0.999 ^{NS}	0.062 ^{NS}
8-Hours	4.93	0.79	4.73	0.94	4.47	0.90	0.999 ^{NS}	0.128 ^{NS}	0.729 ^{NS}
12-Hours	4.93	0.83	4.97	1.07	4.90	0.89	0.999 ^{NS}	0.999 ^{NS}	0.999 ^{NS}
24-Hours	4.60	0.86	4.40	1.30	4.47	1.38	0.999 ^{NS}	0.999 ^{NS}	0.999 ^{NS}
% Change at 24-Hours	20.9%	–	6.6%	–	21.2%	–	0.180 ^{NS}	0.999 ^{NS}	0.167 ^{NS}

Standard deviation (SD). P-value <0.05 is considered to be statistically significant.

* P-value<0.05, **P-value<0.01, ***P-value<0.001, NS: Statistically Non-Significant.

Table 2: The inter-group comparison of pain score (VRS) (n=90).

Pain Score	Group A [n=30]		Group B [n=30]		Group C [n=30]		P-value [Inter-Group]		
	Mean	SD	Mean	SD	Mean	SD	Group A v Group B	Group A v Group C	Group B v Group C
2-Hours	2.83	0.70	2.37	0.62	2.80	0.66	0.023*	0.999 ^{NS}	0.038*
4-Hours	2.43	0.50	1.90	0.61	2.63	0.85	0.008**	0.834 ^{NS}	0.001***
8-Hours	2.10	0.61	2.13	0.78	2.67	0.61	0.999 ^{NS}	0.004**	0.008**
12-Hours	1.93	0.64	2.03	0.77	2.07	0.64	0.999 ^{NS}	0.999 ^{NS}	0.999 ^{NS}
24-Hours	1.93	0.64	2.07	0.79	1.80	0.66	0.999 ^{NS}	0.999 ^{NS}	0.430 ^{NS}
% Change at 24-Hours	27.8%	–	9.4%	–	31.9%	–	0.109 ^{NS}	0.999 ^{NS}	0.033*

P-value <0.05 is considered statistically significant. *P-value<0.05, **P-value<0.01, ***P value<0.001, NS: Statistically Non-Significant.

Complications: There were no complications in this study related to the use of local analgesics.

Discussion

Laparoscopic cholecystectomy is a very commonly performed surgery. Lots of studies are done till date for detailed evaluation of postoperative pain, its origin, and various modalities to minimize it. However, in the first few hours’ pain is bothersome even in laparoscopy. This causes morbidity and prolonged hospital stay which sometimes nullify the advantages of laparoscopy.

There are three types of pain in postoperative period after laparoscopic cholecystectomy. Port site pain is a parietal pain originated from incision site.^[4] Dissolved CO₂ causes diaphragmatic irritation. Additionally due to stretching of diaphragm and peritoneum there is pain which is visceral pain.^[5] Visceral pain is mainly in the immediate postoperative period, stays for a short duration, not affected by ambulation,

but increases on coughing. Shoulder tip pain is a referred pain caused by stimulation of phrenic nerve.^[6] Phrenic nerve stimulation can be due to mechanical stretching of the diaphragm or chemicals due to dissolved CO₂. Shoulder pain is seen up to 72 hours postoperatively may be due to persistent trapped CO₂ in the subdiaphragmatic regions. This is seen in 35 to 63% of patients.^[7]

In view of the multiple side effects of systemic analgesics, there is growing interest in finding alternative local analgesia or other methods to minimize the use of systemic analgesics. Many authors published papers on the different ways by which these pains can be reduced. Use of smaller trocars, low pressure CO₂, short duration of surgery, N₂O instead of CO₂ are few of them which showed significant decrease in pain.^[8,9]

Multimodal pain management includes NSAIDs, opioids, paracetamol & local anesthetics.^[10] We used Diclofenac 75 mg intravenous systemic analgesia for rescue post-operative pain relief. Local analgesics such as topical wash gave significant postoperative pain relief in the study by Boddy AP

at all.^[11] Donatsky AM et al., in a systematic review proved the role of intraperitoneal saline in the prevention of postoperative pain in Laparoscopic cholecystectomy.^[12]

In a Cochrane Database Systemic Review in 2014, Loizides S et al., concluded that use of local infiltration of anaesthetics at port site significantly reduces port site pain.^[13] Intraperitoneal instillation of local analgesics into the gallbladder bed and right subdiaphragmatic space is studied by many authors.^[3,14] The rationale for this route is that the peritoneum is exposed to local analgesics that block the visceral nociceptive conduction from the area of tissue damage and the peritoneum. In addition analgesic gets absorbed from the large peritoneal surface acting as a further mechanism of analgesia. Intraperitoneal administration of local anaesthetic also reduces nausea and vomiting.^[13]

In the setting of day care surgery, intraperitoneal instillation is a simple and less invasive way of analgesia as compared to other nerve blocks. However, local anaesthetics having longer duration of action and safe pharmacokinetics are needed. Since 1991, Bupivacaine is the most commonly used local anaesthetic for intraperitoneal infiltration.^[6,10,15] There are plenty of evidences regarding the analgesic effect of Bupivacaine in the dose ranging from 50-200mg in volume 10-100ml. At this dose, the plasma Bupivacaine concentration was 0.92-1.24 mcg/ml, which is below the toxic level of 3 mcg/ml.^[15] This study used 20 ml of 0.5% Bupivacaine. We had no side effects of bupivacaine in our study.

Roberts KJ et al. compared 0.25% bupivacaine and normal saline given at trocar sites, subdiaphragmatically and intraperitoneally.^[16] VAS scores were lowest for the longest period in the subdiaphragmatic group rather than the intraperitoneal wash technique. We have not given a peritoneal wash but instilled bupivacaine in the subdiaphragmatic region and over the gall bladder bed and found similar results.

In our study, VAS score was significantly lowered by the use of intraperitoneal and port site instillation of bupivacaine mainly in the initial 4 hours and no significant difference after 8 hours of surgery. The initial hours are more crucial for pain and best to be managed by this method rather than with systemic analgesics.

Many studies have shown beneficial analgesic effects using both intraperitoneal and trocar site infiltration of various long-acting analgesics like bupivacaine and ropivacaine.^[17,18] Narachi P et al. compared lignocaine and bupivacaine intraperitoneal infiltration with normal saline in day-care laparoscopic surgeries.^[19] They proved that local analgesics effectively reduce shoulder tip pain and total analgesic dose. NT Das et al compared bupivacaine and ropivacaine intraperitoneal and trocar sites and showed a significant decrease in postoperative pain and shoulder tip pain.^[18] In our study, there was no statistically significant difference in the incidence of shoulder tip

pain.

Adverse effects associated with the use of local analgesia such as allergic reactions, cardiovascular, central nervous system, and systemic toxicity, which are possible complications. Intraperitoneal administration of local anaesthetic reduces nausea and vomiting.^[13] In this study, there was no complication related to local anesthesia instillation. Nausea and vomiting was not significant in all groups.

Conclusion

The instillation of bupivacaine at the port site and intraperitoneal at the gallbladder fossa and sub-diaphragmatically significantly decreases the pain in the initial post-operative period in laparoscopic cholecystectomy.

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