

## **Bupivacaine irrigation of the gallbladder bed is effective in postoperative pain management after laparoscopic cholecystectomy.**

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**Abstract: Introduction:** Laparoscopic cholecystectomy, one of the most common operations performed by surgeons is now considered the gold standard of therapy for symptomatic cholelithiasis and chronic cholecystitis. The administration of local anesthetic, bupivacaine can be helpful in reducing the negative effect of postoperative pain after gall bladder surgery.

**AIM:** To evaluate the post operative pain in laparoscopic cholecystectomy patients using bupivacaine irrigation over gallbladder surgical bed.

**Materials and Methods:** A randomized control study was conducted in a tertiary care hospital with sample size of 170 patients, aged between 30-50 years. The patients were divided into two Groups A – Saline, B – 0.5 Bupivacaine irrigation; 85 patients in each group underwent elective and emergency laparoscopic cholecystectomy. Pain was assessed at 0, 6, 12, and 24 hours by using a visual analog scale (VAS). Statistical analysis was performed using a 2-tailed t test and chi-square analysis; significance was determined as  $P < .05$ .

**Results:** Compared to group A, group B had better postoperative pain relief in the first twenty four hours with no complications.

**Conclusions:** Gall bladder bed irrigation with 0.5% Bupivacaine is safe and effective method of reducing postoperative pain for cholecystectomy.

**Keywords:** laparoscopic cholecystectomy, Bupivacaine, Saline, postoperative pain.

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Date of Submission: 06-01-2020

Date of Acceptance: 21-01-2020

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### **I. Introduction**

In the modern era, laparoscopic cholecystectomy has become the recommended option compared to open cholecystectomy in the treatment of benign gall bladder disease. laparoscopic cholecystectomy currently, is considered the gold standard of therapy for symptomatic cholelithiasis and chronic cholecystitis. Laparoscopic cholecystectomy serves many advantages of decreased postoperative pain, cosmesis, morbidity, faster recovery and shorter hospital stay over conventional open surgery. However laparoscopic cholecystectomy is not a pain-free procedure. Early postoperative pain remains a major pitfall in patients undergoing laparoscopic cholecystectomy

Laparoscopic cholecystectomy has improved surgical outcome in terms of reduced pain and convalescence compared to conventional cholecystectomy. However, postoperative pain is considerable. In laparoscopic cholecystectomy, pain is derived from multiple causes: incision pain (somatic), deep intraabdominal pain (visceral), and shoulder pain (visceral pain due to phrenic nerve irritation) (1).

Postoperative pain is considerable in elective laparoscopic cholecystectomy. Pain management with multiple analgesic and opioids has been reported with variable success (2). The main cause for staying overnight in the hospital on the day of surgery in 17% to 41% of the patients is pain, which is also the primary reason why patients have a longer convalescence (2).

The study is aimed at evaluating the use of the irrigation of a local anaesthetic in the gallbladder surgical bed, such as bupivacaine, for postoperative pain reduction.

### **II. Materials And Methods**

A prospective study was conducted on 170 patients of either sex, who diagnosed to have benign gall bladder disease and planned for laparoscopic cholecystectomy at the Department of General Surgery, A. J. Institute of Medical Sciences and Research Centre, Mangalore during the period 2 year from October 2015 to September 2017 were recruited.

Patient with underlying respiratory and cardiac abnormalities, or received recent surgical procedure, on prolonged use of pain medication, in whom drain is placed after the procedure and allergic to bupivacaine were excluded from the study.

The study was approved by the Institutional Ethics Committee (Ref no. AJEC/REV/2603/2019). Informed and written consent was obtained from all participants in the trial. A brief history was recorded. Pre operative investigations include liver function tests, complete hemogram, renal function tests and coagulation profile.

One hundred and seventy patients undergoing elective laparoscopic cholecystectomy were randomized into 2 groups : Group 1 was control gall bladder group, irrigated with normal saline without bupivacaine at the surgical bed. Group 2 was the experimental group and received 20 ml of 0.5% bupivacaine irrigation in the gall bladder bed after laparoscopic cholecystectomy.

**Evaluation of pain:** All the patients after the surgery were kept under observation in post operative ward for 4-6 hours. Pain in the post operative period was assessed using Wong Baker Faces scale. The pain assessment was carried out by nurses, at 0, 1, 2, 6, 12 hours after the patient was received from the operation theatre. All the patients were allowed to receive analgesic medication as needed, and the requirement of these medications was recorded using VAS at at 0, 1, 2, 6, 12 hours.

**Statistical analysis:** Statistical analysis was performed with SPSS version 13.0 (SPSS, Chicago, IL, USA). Statistical analysis was performed using a 2-tailed t test and chi-square analysis; significance was determined as  $P < .05$ . Post hoc test and Bonferroni test were applied to analyse the change of mean difference and change of the standard deviation difference at different time intervals between both the groups.

### III. Results

One hundred and seventy patients were included in this protocol; 85 each in the control group (group 1) and the bupivacaine group (group 2). An age group of 31-40 years had highest number of patients, constituting 24.1% (41 patients) and further, in each group 1 and 2 they constituted 20% and 28.2% respectively (**Table 1**). Out of total 170 patients recruited in this study, 90 were women and 80 were men. The mean age group in group 1 and group 2 was  $47.09 \pm 13.48$  and  $44.52 \pm 13.76$  years, respectively and there was no significant difference between both groups (**Table 2**).

Out of 170 patients 146 patients did not receive any extra analgesic. Total 24 patients with severe pain received analgesics among which majority were of control group 17, accounting for 20% and 7 patients in group 2, accounting for 8.2%. There was significant reduction in extra analgesic requirement in group 2 ( $p = 0.028$ ). This difference was mainly noted at the 6-hour interval postoperatively (**Table 3; Fig 1**). Post hoc analysis showed a significant difference in the post operative pain between the groups 1 and 2 (**table 4 and 5**).

### IV. Discussion

Laparoscopic cholecystectomy is one of the most frequently performed elective surgeries. In this study we understood the importance of post operative pain in patients undergoing laparoscopic cholecystectomy. The study methods included selection of patients who were planned for elective laparoscopic cholecystectomy for benign gall bladder disease in surgical wards. Levobupivacaine was selected for the study purpose as it is a long acting local anaesthetic and least systemic toxicity. The cost of procuring the drug was borne by study team and the patients in the study group were not charged anything.-

The volume of drug we used (0.20%) was with reference to the previous studies conducted (5 ,6, 7). Bupivacaine 0.20% was effective in providing pain relief upto 12 hours post op. The need of rescue analgesics, the adverse effects as well as duration of hospital stay were similar in both the groups (8). Shoulder tip pain was statistically insignificant in both the study groups. No cases in the present study had any signs or symptoms of local anaesthetic toxicity in any manner. No adverse effects were noted. The duration of post operative analgesia obtained was similar to Bupivacaine.

Conventional analgesia intravenous Tramadol was used for pain relief (9). The study results showed that there was significant decrease in the pain reduction in the post operative period in patients who received the bupivacaine. The study also showed that there was reduction in the extra analgesic required in the group who received bupivacaine when compared to those who received normal saline.

We used the intraperitoneal instillation of local anaesthetics at the end of the procedure in the trendelenburg position with the trocars intact (10). No local anaesthetics were instilled into the surgical wound created. This may be due to the fact that we instilled the local anaesthetic in the trendelenburg position at the end of surgery which may have resulted in better dispersion of the drug and hence the beneficial effect upto 12 hour post op. Also instillation of local anaesthetics in the supine position prevented its flow over the coeliac plexus and phrenic nerve endings which can be an important pathway for post op pain relief. The lower dose

used for both the local anaesthetic agents proved better for post op analgesia when compared to previous studies, without any risk of systemic toxicity(11).

In the present study we could not elicit any significant difference in the study groups with respect to the rescue analgesic consumption or in the duration of hospital stay. Similar results were obtained by chundrigar et al (12) in their study.

Similar to other studies regarding the pain scores is the inter-individual variability of pain thresholds and perception was major limitation in present study..

### V. Conclusion:

Our study showed that the irrigation of gall bladder bed with bupivacaine in patients undergoing laparoscopic cholecystectomy is an effective, simple and safe analgesic technique that reduces post operative pain and hence better outcome.

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**Table 1. Age distribution**

Age	Group 1 (Control)	Group 2 (Bupivacaine)	Total	p value
20 and below	1 (1.2%)	1 (1.2%)	2 (1.2%)	<b>0.625</b>
21-30	10 (11.8%)	15 (17.6%)	25 (14.7%)	
31-40	17 (20.0%)	24 (28.2%)	41 (24.1%)	
41-50	22 (25.9%)	14 (16.5%)	36 (21.2%)	
51-60	20 (23.5%)	18 (21.2%)	38 (22.4%)	
61-70	12 (14.1%)	10 (11.8%)	22 (12.9%)	
Above 70	3 (3.5%)	3 (3.5%)	6 (3.5%)	

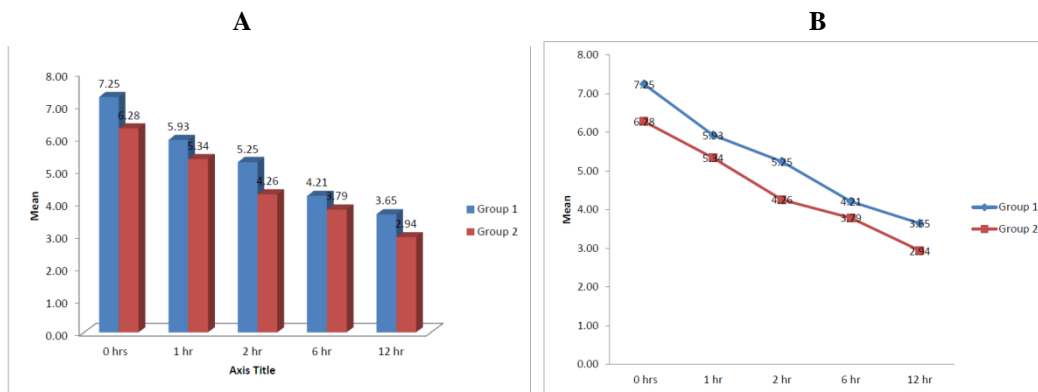
**Table 2. Demographic characteristics**

	Group 1, (Control) (n=85)	Group 2, (Bupivacaine) (n=85)	Chi square test (X <sup>2</sup> ); p value
Sex (M/F)	38/47	42/43	X <sup>2</sup> =0.38; p=0.54
Mean Age (year±SD)	47.09 ±13.48	44.52± 13.76	X <sup>2</sup> =1.52 p=0.219
Extra analgesic requirement (No/Yes)	17/68	7/78	X <sup>2</sup> =4.82 p=0.028*

**Table 3:** ANOVA test of standard deviation of pain score at different intervals.

Group	N	Mean	SD	Repeated measures ANOVA F	P	Percentiles		
						25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>
Group 1 score 0 hr	85	7.25	0.975	354.776	0.000	6.00	8.00	8.00
1 hr	85	5.93	0.573			6.00	6.00	6.00
2 hr	85	5.25	0.975			4.00	6.00	6.00
6 hr	85	4.21	0.692			4.00	4.00	4.00
12 hr	85	3.65	0.767			4.00	4.00	4.00
Group 2 score 0 hr	85	6.28	0.701	274.768	0.000	6.00	6.00	6.00
1 hr	85	5.34	0.946			4.00	6.00	6.00
2 hr	85	4.26	0.742			4.00	4.00	4.00
6 hr	85	3.79	0.619			4.00	4.00	4.00
12 hr	85	2.94	1.004			2.00	2.00	4.00

control group (group 1) and the bupivacaine group (group 2).



**Figure 1.** ANOVA test 1(A) and test 2 (B) among control group (group 1) and the bupivacaine group (group 2).

**Table 4:** Post hoc analysis 1 among control group (group 1) and the bupivacaine group (group 2).

Group		Change		Bonferroni test
		Mean difference	SD	
Group 1	score-0 hr- score-1hr	1.318	0.964	0.00*
	Score-0 hr- score 2 hr	2.000	1.234	0.00*
	Score-0 hr-score-6 hr	3.035	1.005	0.00*
	Score-0 hr-score-12 hr	3.600	1.104	0.00*
	Score-1 hr-score-2 hr	0.682	0.954	0.00*
	Score-1 hr-score-6hr	1.718	0.766	0.00*
	Score-1 hr-score-12hr	2.282	0.825	0.00*
	Score-2hr-score-6 hr	1.035	1.005	0.00*
Group 2	Score-2 hr –score-12 hr	1.600	1.014	0.00*
	Score-6 hr-score-12hr	0.565	0.906	0.00*
	score-0 hr-score-1hr	0.941	1.095	0.00*
	Score-0 hr- score 2 hr	2.024	1.046	0.00*
	Score-0 hr-score-6 hr	2.494	0.921	0.00*
	Score-0 hr-score-12 hr	3.341	1.287	0.00*
	Score-1 hr-score-2 hr	1.082	1.003	0.00*
	Score-1 hr-score-6hr	1.553	0.994	0.00*
Group 2	Score-1 hr-score-12hr	2.400	1.060	0.00*
	Score-2hr-score-6 hr	0.471	0.853	0.00*
	Score-2 hr –score-12 hr	1.318	1.003	0.00*
	Score-6 hr-score-12hr	0.847	0.994	0.00*

\*Indicate highly significant.

**Table 5: Post hoc analysis 2 among control group (group 1) and the bupivacaine group (group 2).**

Scores	Group	Mean difference	SD	T test value	P
0 hr – 1 hr	Group 1	1.318	0.954	2.39	0.018*
	Group 2	0.941	1.095		
0 hr- 2 hr	Group 1	2.000	1.234	0.13	0.894
	Group 2	2.024	1.046		
0 hr – 6 hr	Group 1	3.035	1.005	3.66	0.000
	Group 2	2.494	0.921		
0 hr – 12 hr	Group 1	3.600	1.104	1.41	0.162
	Group 2	3.341	1.287		
1 hr – 2 hr	Group 1	0.682	0.954	2.67	0.009
	Group 2	1.082	1.003		
1 hr – 6 hr	Group 1	1.718	0.766	1.21	0.229
	Group 2	1.553	0.994		
1 hr – 12 hr	Group 1	2.282	0.825	0.81	0.421
	Group 2	2.400	1.060		
2 hr – 6 hr	Group 1	1.035	1.005	3.95	0.000
	Group 2	0.471	0.853		
2 hr – 12 hr	Group 1	1.600	1.014	1.83	0.070
	Group 2	1.318	1.003		
6 hr – 12 hr	Group 1	0.565	0.906	1.94	0.055
	Group 2	0.847	0.994		

\*Indicate significant.

Dr Rithin Suvarna, et.al. "Bupivacaine irrigation of the gallbladder bed is effective in postoperative pain management after laparoscopic cholecystectomy". *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(1), 2020, pp. 27-31.