ORIGINAL RESEARCH

Comparative Study of Intra peritoneal Bupivacaine with Dexmedetomidine versus Intraperitoneal Bupivacaine with Fentanyl for post-operative analgesia in Laparoscopic Cholecystectomy in a tertiary care hospital in north India

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ABSTRACT

Background: Postoperative analgesia in laparoscopic cholecystectomy significantly affects the recovery profile and discharge of the patient. This study compares fentanyl and dexmedetomidine as adjuvants to bupivacaine in intraperitoneal instillation after laparoscopic cholecystectomy, in terms of their impact on analgesic efficacy and recovery profile. Sixty patients were randomised into two groups with thirty patients in each group; group BF was administered 20 ml of 0.25% bupivacaine + 10 ml of 2 µg/kg fentanyl; and group BD received 20 ml of 0.25% bupivacaine + 10 ml of 1 µg/kg dexmedetomidine. After 8 h, Post-Anaesthesia Discharge Scoring System (PADS) scored for determining recovery profile. Analgesic profile was assessed using Verbal Rating Scale and rescue analgesia requirement seen. Sedation was scored using Ramsay sedation scoring.

Results:Groups Bupivacaine + Fentanyl(BF)and Bupivacaine + Dexmedetomidine(BD) had a similar analgesic profile. Ramsay sedation scores were significantly higher in group BD when compared to group BF. However, the Post Anaesthesia Discharge Score (PADS) remained comparable in both groups ($P = 1$).

Conclusion: Intraperitoneal instillation of bupivacaine in combination with dexmedetomidine or fentanyl significantly reduces postoperative pain scores, in patients undergoing laparoscopic cholecystectomy. However, fentanyl may be preferred over dexmedetomidine, because it causes less sedation and achieves a better score.

Keywords: Dexmedetomidine, Pain, Post-operative, Fentanyl, Bupivacaine, Intra-peritoneal

INTRODUCTION

Laparoscopic cholecystectomy as opposed to open cholecystectomy is currently the most accepted surgical technique for cholelithiasis. Laparoscopic procedures have many advantages over open procedures such as lesser haemorrhage, better cosmetic results, lesser post-operative pain, and shorter recovery time, leading to shorter hospital stay and less expenditure.

But even Laparoscopic Cholecystectomy is associated with postoperative pain affecting early ambulation of the patient. Pain in laparoscopic surgery results from stretching of the abdominal cavity, peritoneal inflammation, diaphragmatic irritation and residual carbon dioxide (CO2) in the peritoneal cavity. Peritoneal irritation by carbonic acid (formed by reaction between carbon dioxide CO2 and water) and the creation of space between the liver and diaphragm by residual pneumoperitoneum has been implicated for visceral and shoulder tip pain. Humidity and volume of the insufflated gas, wound size and trauma to the parietal peritoneum may also be responsible for this pain (Alexander & Hull, 1987; Mouton et al., 1999).

Local anaesthetics along with adjuvants like alpha-2 agonists (Dexmedetomidine & clonidine), opioids like

Fentanyl have been used to achieve good pain relief and early ambulation in patients undergoing laparoscopic surgery.

Since there are a few studies which have compared the anti-nociceptive effects of intraperitoneal fentanyl to intraperitoneal dexmedetomidine, the present study was undertaken in our tertiary care hospital to compare the effects of intraperitoneal bupivacaine with dexmedetomidine or fentanyl as adjuvants, in patients undergoing laparoscopic cholecystectomy. The aim was to compare the effects of Intraperitoneal Bupivacaine with Dexmedetomidine or Fentanyl as adjuvants in patients undergoing Laparoscopic Cholecystectomy on post operative pain, haemodynamic stability and post anaesthesia discharge score.

METHODS

After obtaining approval from Institution Ethics Committee, sixty patients, in the age group of 18–60 years belonging to ASA physical status I and II, undergoing laparoscopic cholecystectomy were included and written informed consent was obtained. The study was conducted over a period of 1 year. The patients with BMI less than 18 or > 30 kg/m2, with psychiatric illness and with coagulation disorders; those allergic to local anaesthetics, dexmedetomidine or fentanyl; and patients with heart block or heart rate less than 50 bpm were excluded. Patients who were converted into open cholecystectomy due to any reason were also excluded.

The patients included in the study were divided into 2 groups of 30 each - BD (bupivacaine+ dexmedetomidine) and BF (bupivacaine+ fentanyl group) on the basis of computer-generated randomization. The operating surgeon and observer anaesthetist who collected the postoperative data were blinded to the test drug/combination administered through the laparoscopic port intraperitoneally, as the drug was prepared by a doctor not involved in the study.

Patients were educated about the 10-point Verbal Rating Score (VRS) 1 day prior to surgery where 0 is no pain and 10 is the worst imaginable pain. All patients were pre-medicated with oral alprazolam 0.25 mg the night prior to surgery.

On arrival to the operation theatre, after attaching base-line monitors, all the patients were induced with inj. Fentanyl 2µg/kg, inj. Propofol till the verbal response was lost. The muscle relaxation was achieved with inj. Atracurium 0.5 mg/kg and anaesthesia was maintained with amixture of oxygen + nitrous oxide and sevoflurane.

Pre-incisional installation was done by the surgeon using 20 ml of 0.25% bupivacaine (5 ml for each port). Intraoperatively all patients received 4 mg ondansteroniv, 1 gm Paracetamol (PCM) iv and 75 mg diclofenac iv. At the end of surgery once gallbladder was removed and the peritoneal wash had been done, the study drug was injected through the port on the liver bed (1µg/kg of Dexmedetomidine diluted to a total of 10ml in group BD and 2µg/kg of Fentanyl diluted to a total of 10 ml in group BF). If a drain was introduced, it was kept clamped for 1 hour post-operatively. The residual neuro neuromuscular blockade was reversed with injection neostigmine 0.05 mg/kg and injection glycopyrrolate 0.01 mg/kg.

Data was collected after the patient was shifted to Post-Anaesthesia Care Unit (PACU). Heart rate, systolic and diastolic blood pressure, Mean Arterial Pressure (MAP) and SpO2 were recorded at 0, 1, 2, 4, 6 and 8 hours of intervals after surgery. The time 0 started when the patient was shifted to Post-Anaesthesia Care Unit (PACU). If heart rate was less than 50 beats per minute, injection atropine was given. Injection mephentermine was given in 3 mg bolus if the mean arterial pressure was less than 20% of the baseline.

The pain was assessed in the post operative period using the 10-point Verbal Rating Score(VRS) at 0, 1, 2, 4, 6 and 8 hours, where 0 is no pain and 10 is the worst imaginable pain. When the Verbal Rating Score(VRS)was more than 3, injection diclofenac 75 mg intravenous was administered as an infusion in 100 ml normal saline.

At 1, 2, 4, 6 and 8 hr, sedation was checked using the Modified Ramsay Sedation Scale score and postoperative nausea and vomiting (PONV) was assessed using PONV score.

The patients were scored using Post-Anaesthesia Discharge Scoring System (PADS) for determining home readiness (Kahokehr et al., 2011) at 8 h from surgery. The total possible score was 10; a patient scoring ≥ 9 was considered fit for discharge. It included vital signs, activity level, nausea and vomiting, pain and surgical bleeding.

Data was presented as frequency, mean and standard deviation whenever applicable. Categorical variables between the 2 groups were compared using the chi-square test of Fischer exact test. One-way ANOVA followed by post hoc analysis (Bonferroni) was used to compare quantitative variables between 2 groups. P value < 0.05 was considered significant. Statistical analysis was performed using SPSS 21.

RESULTS

Table 1: Demography of patients

Parameters	Group bd	Group bf	P-value
AGE (MEAN ±SD)	33 ± 6.73	33 ± 6.47	0.999
SEX			
MALE (%)	10	08	0.573

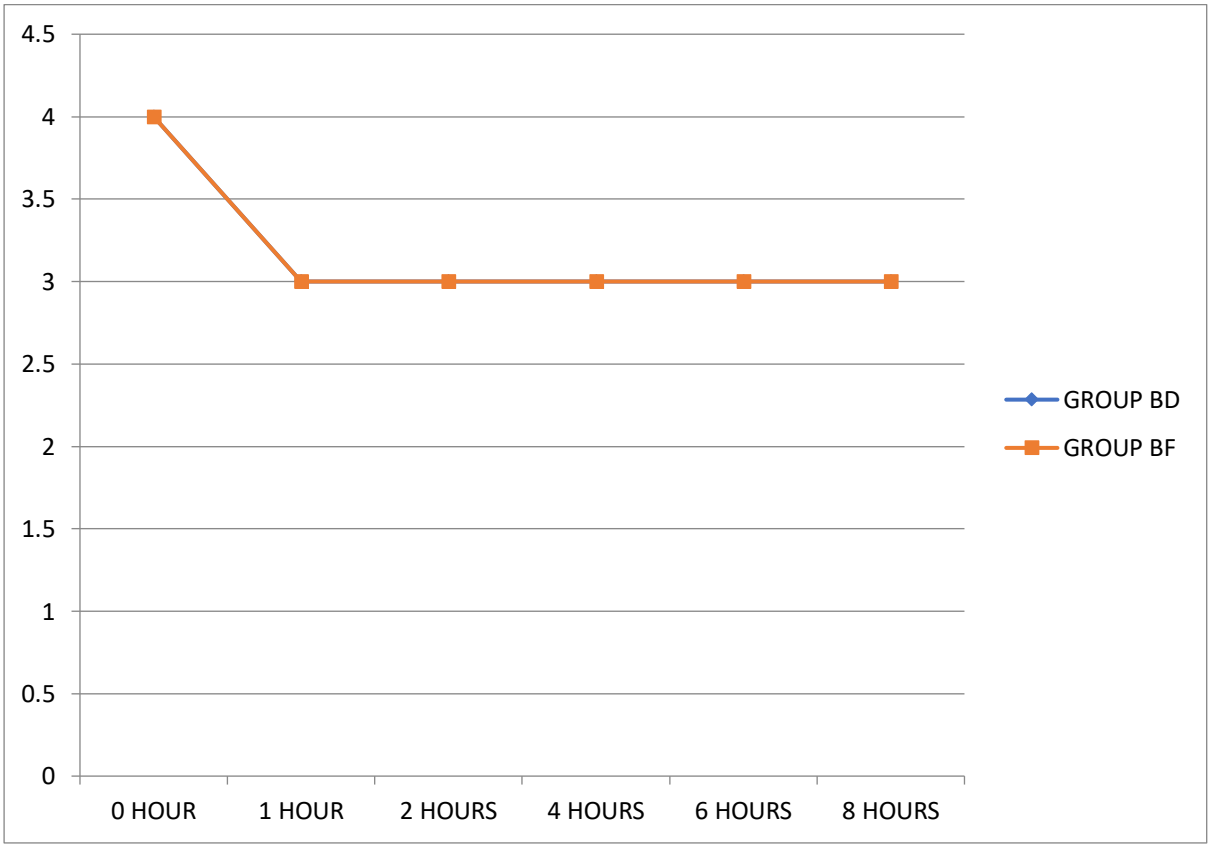
FEMALE (%)	20	22	
WEIGHT (IN KG) (MEAN ±SD)	69 ± 4.52	67 ± 4.7	0.098
ASA			
ASA I	15	16	0.796
ASA II	15	14	

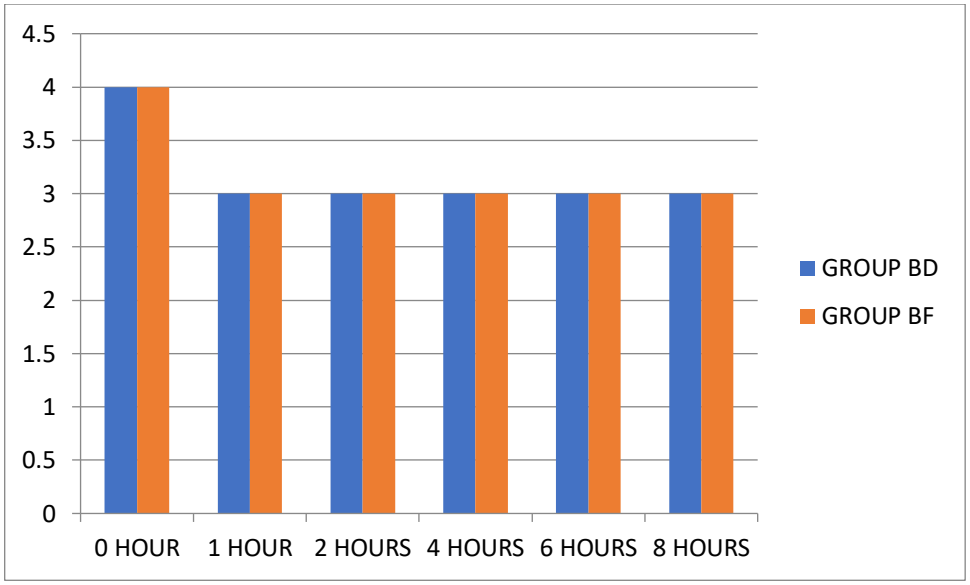
Table 1 states that the demographic data was comparable among the two groups.

Table 2: comparison of post operative vrs between group bd and group bf

Time period for vrs	Group bd		Group bf		P-value
	Mean	Sd	Mean	Sd	
0 HOUR	4	0.78	4	0.81	1
1 HOUR	3	0.81	3	0.83	1
2 HOURS	3	0.81	3	0.83	1
4 HOURS	3	0.5	3	0.63	1
6 HOURS	3	0.49	3	0.5	1
8 HOURS	3	0.5	3	0.5	1

Table 2 states that the verbal rating score (VRS) or pain score was analysed at 0,1,2,4,6 and 8 hours. The scores were comparable between both the groups.





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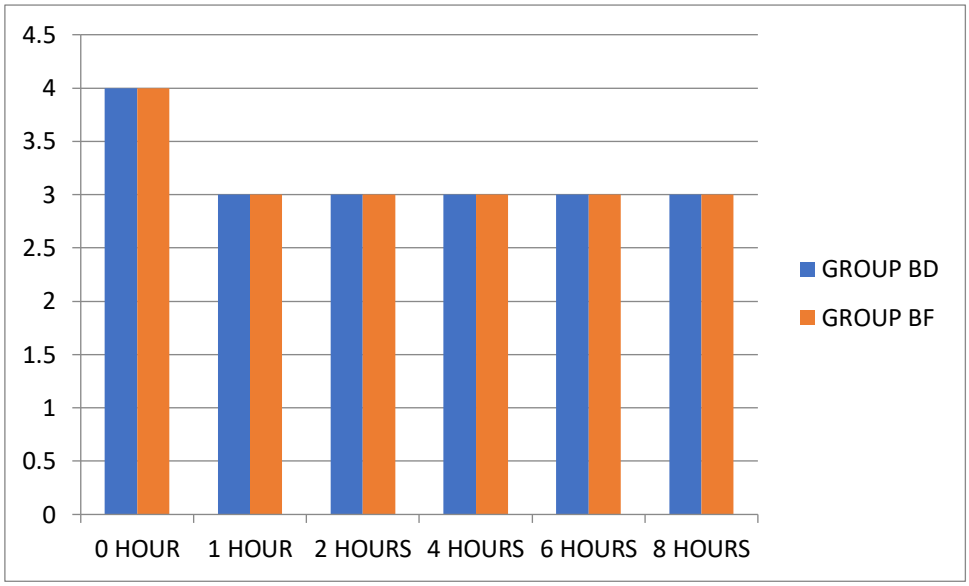


Table 3: Comparison Of Pads Between Group Bd And Group Bf

Time Period For Pads	Group Bd		Group Bf		P-Value
	Mean	Sd	Mean	Sd	
8 HOURS	10	0.5	10	0.31	1

Table 3 states that the PADS score of 9 and more was achieved by all the patients in both the groups. All the patients met with the discharge criteria at the end of 8 hours indicating that the patients in both the groups were comfortable with regard to analgesia, PONV and sedation.

Table 4: comparison of post operative sedation (mrss) between group bd and group bf

Time period for sedation (mrss)	Group bd		Group bf		P-value
	Mean	Sd	Mean	Sd	
0 HOUR	3	0.45	2	0.81	0.0001*
1 HOUR	3	0.35	1	0.73	0.0001*
2 HOURS	3	0.63	2	0.73	0.0001*
4 HOURS	2	0.58	1	0.62	0.0001*
6 HOURS	3	0.68	1	0.56	0.0001*
8 HOURS	2	0.72	1	0.45	0.0001*

Table 4 states that the sedation score was assessed with the Ramsay sedation score and was more with the BD group as compared to the BF group at 0,1,2,4,6 and 8 hours post-operatively and was statistically significant, however the sedation score was not more than 3 at any point so all patients were arousable and did not need any intervention.

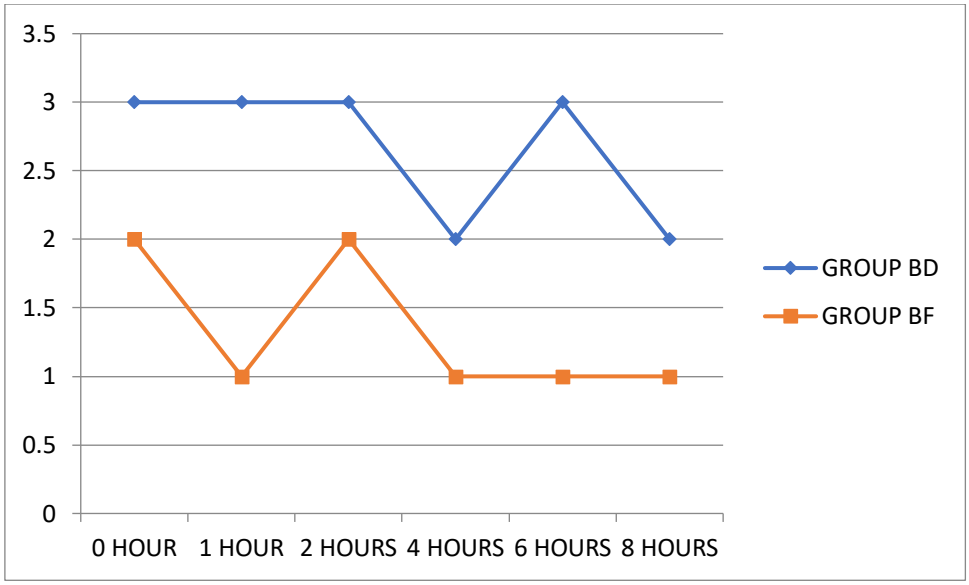


Table 5: comparison of post operative nausea & vomiting between group bd and group BF at 8 hours

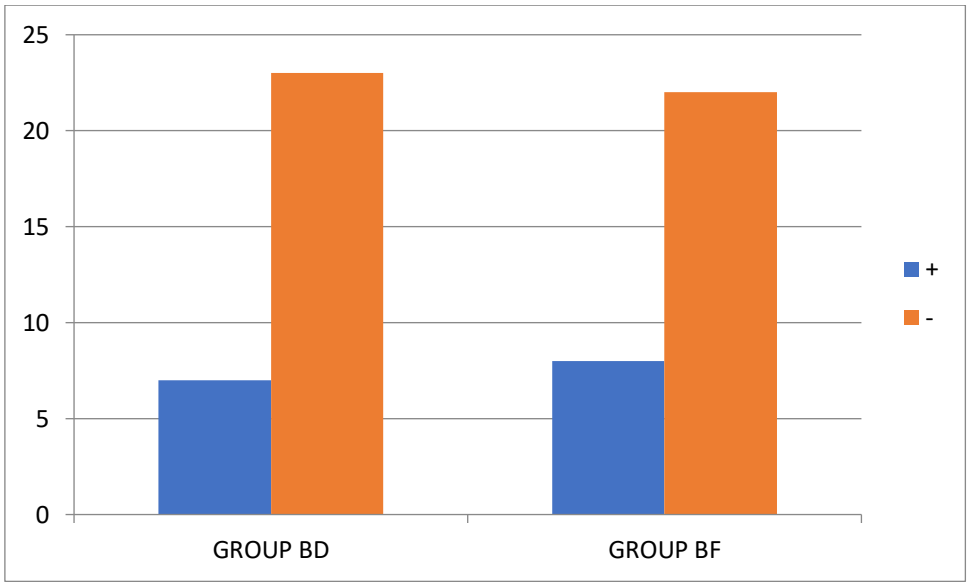
Time period for nausea & vomiting at 8 hours	Group BD	Group BF	P-value
0	20	20	1
1	2	2	
2	0	0	

Table 5 states that the incidence of post operative nausea and vomiting was comparable in both the groups at the end of 8 hours.

Table 6: comparison of post operative rescue analgesia between group bd and group bf

Rescue analgesia	Group bd	Group bf	P-value
+	07	08	0.765
-	23	22	

Table 6 states that the rescue analgesia was administered in the form of Inj. diclofenac 75 mg intravenous, 7 and 8 patients in dexmedetomidine and fentanyl groups required analgesia and the rescue analgesia requirement was not statistically significant amongst the two groups



DISCUSSION

Laparoscopic cholecystectomy has shown to be superior to open cholecystectomy with reduced post-operative pain, morbidity and duration of convalescence. Post-operative pain after laparoscopic cholecystectomy consists of three components, visceral, parietal and referred shoulder pain distinguishable from each other in the intensity, latency and duration.

The rationale for intraperitoneal administration of drugs is that the small incisions at the abdominal wall cause visceral component of the pain and shoulder pain. With this in mind, many authors have tried to diminish pain via the peritoneal route. Intra Peritoneal Local Anaesthetic is likely to block free afferent nerve endings in the peritoneum. Systemic absorption of LA from the peritoneal cavity may also play a part in reduced nociception although this would be expected to occur after any LA technique (Gupta et al., 2010).

The present study was aimed to compare the analgesic efficacy of intraperitoneal bupivacaine with dexmedetomidine or fentanyl and to compare their effect on recovery profile in patients undergoing laparoscopic cholecystectomy. We observed that a discharge criterion (PADS) was much favourable in the patients receiving fentanyl in adjunct to bupivacaine (group BF) as compared to group BD. This observation could be attributed to the fact that patients who received dexmedetomidine with bupivacaine had a higher sedation score, hence lower discharge credibility. Other criteria used in Post Anaesthesia Discharge Score were Verbal Rating Score, haemodynamic stability in the form of hear rate, blood pressure, Post-operative Nausea Vomiting (PONV), and sedation.

There was no statistically significant difference in the VRS score between bupivacaine-dexmedetomidine and bupivacaine-fentanyl groups at all time intervals up to 8 hours. Our study observed that the number of patients who required rescue analgesia was the same in both the groups. Gupta et al. conducted a study to compare the effectiveness of intraperitoneal bupivacaine with or without fentanyl for postoperative analgesia after laparoscopic surgery and found that 20 ml of 0.5% bupivacaine + 100μg fentanyl significantly reduced the immediate postoperative pain (VAS 40.1 ± 9.8 vs. 65.2 ± 9.5; VRS 2.2 ± 0.4 vs. 3.8 ± 0.4). It also reduced the intensity of pain even after 24 h (VRS 40.3 ± 7.4 vs. 50.1 ± 7.8; VRS 3.50 ± 1.2 vs. 4.23 ± 0.78).

Similarly, Elnabtity and Ibrahim (Oza et al., 2016) compared the postoperative pain when intraperitoneal bupivacaine (0.25%) is administered alone versus the addition of dexmedetomidine (1μg/kg) to it in 52 children undergoing a laparoscopic appendectomy in a prospective randomised trial. Postoperative visual analogue scale scores were lower in the dexmedetomidine group at 2, 4 and 6 h (mean = 3, 3, 3, respectively) compared with the plain bupivacaine group (mean = 4, 5, 4, respectively) ($P < 0.05$) but had more sedation scores at 0, 2 and 4 h ($P < 0.05$), longer time to first rescue analgesia ($P = 0.03$), lesser rescue analgesic consumption ($P = 0.02$), shorter length of hospital stay ($P = 0.02$) and higher parents' satisfaction ($P = 0.01$). They concluded that adding dexmedetomidine to intraperitoneal bupivacaine provides adequate postoperative analgesia in children undergoing laparoscopic appendectomy.10 The study results were in accordance with our study.

It was observed that the addition of dexmedetomidine or fentanyl to bupivacaine was not associated with postoperative nausea and vomiting in the present study. Oza et al. (Bakhamees et al., 2007) in a similar study compared intraperitoneal instillation of 50 ml of bupivacaine 0.25% (125 mg) to 50 ml of bupivacaine 0.25% (125 mg) + 1 μg/kg of dexmedetomidine. They observed that the incidence of postoperative nausea and vomiting was comparable in both groups. Similar results have also been shown by Bakhamees et al. Similarly, in our study, the incidence of the Post Operative Nausea Vomiting (PONV)was insignificant.

Intraperitoneal instillation of local anaesthetic is an easy, cheap and non-invasive method that provides good analgesia in the immediate postoperative period after laparoscopic surgery. The combination of intraperitoneal bupivacaine and dexmedetomidine or fentanyl as an adjuvant reduces postoperative pain in patients who underwent Laparoscopic Cholecystectomy, without any significant adverse events. Both dexmedetomidine and fentanyl when used with bupivacaine reduce not only the intensity of pain but also the rescue analgesia consumption. Although dexmedetomidine and fentanyl provide comparable analgesia when combined with bupivacaine, the comparatively higher sedation observed with dexmedetomidine may hamper the recovery profile. This makes fentanyl a more attractive option when an early discharge is planned.

CONCLUSION

Intraperitoneal instillation of bupivacaine in combination with dexmedetomidine or fentanyl significantly reduces postoperative pain scores in patients undergoing laparoscopic cholecystectomy. Significantly higher sedation scores seen with dexmedetomidine can lead to a delayed resumption of activity and delayed discharge. Hence, fentanyl may be preferred over dexmedetomidine, because it causes less sedation and achieves a better Post Anaesthesia Discharge Score.

AVAILABILITY OF DATA AND MATERIAL

Available with the Department of Anaesthesia, ASCOMS, Sidra, Jammu.

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