

**Original Article**

**A COMPARISON OF INTRAPERITONEAL INSTILLATION OF ROPIVACAINE AND ROPIVACAINE WITH DEXMEDETOMIDINE FOR POSTOPERATIVE ANALGESIA FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE STUDY**

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**ABSTRACT**

**Objective:** laparoscopic cholecystectomy surgeries are having advantages over open cholecystectomy with less pain and quick recovery. Intraperitoneal route of administration of a local anaesthetic is a cheap, easy and non-invasive method of reducing the intensity of post laparoscopic pain. This study compared the postoperative analgesic effect of intraperitoneal instillation of ropivacaine 0.5% and ropivacaine 0.5% with dexmedetomidine (1µg/kg) in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

**Methods:** Total 86 patients were divided equally in 2 groups. Patients in group R received 20 ml 0.5% isobaric ropivacaine hydrochloride+5 ml NS where in Group RD, patients received 20 ml 0.5% isobaric ropivacaine hydrochloride with 1µg/kg dexmedetomidine hydrochloride. Solution was diluted with normal saline to make a total volume 25 ml. Hemodynamic parameters were noted during surgery Postoperatively, patient was assessed for pain using the visual analogue scale (VAS) at 30 min, then 2,4,8,12 and 24 h. Total analgesic consumption in the first 24 h also compared.

**Results:** Baseline demographic profile of study participants were similar. Mean duration of analgesia was significantly higher in group RD (10.05±6.916 h) as compared to group R (5.59±6.8) (p=0.003). Mean dose of rescue analgesia was significantly higher in group R (130.81±61.44) as compared to group RD (75±36.6) (p<0.001). VAS score was significantly higher in group R as compared to group RD at different time intervals.

**Conclusion:** We concluded that intraperitoneal Ropivacaine with Dexmedetomidine produced postoperative analgesia better than ropivacaine alone.

**Keywords:** Ropivacaine, Dexmedetomidine, Intraperitoneal instillation, Laparoscopic cholecystectomy

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**INTRODUCTION**

Minimally invasive surgical procedures are most widely accepted surgical technique nowadays. In most of the health care unit's Laparoscopic cholecystectomy now replace the conventional open cholecystectomy for cholelithiasis.

Advantages of laparoscopic cholecystectomy over open cholecystectomy are less pain and quick recovery, which results in patient's earlier return to normal life [1, 2]. Although minimally invasive, many of the patients experience moderate-to-severe pain in the early postoperative period [3].

Pain after laparoscopic cholecystectomy in early post-operative period is thought to be related to abdominal muscle distension during laparoscopic procedure, irritative effects of residual carbon dioxide in the abdominal cavity and prolonged elevation of diaphragm by pneumoperitoneum. Pain can delay the patient's recovery; prolong hospital stay and increase morbidity and cost [5, 6].

Perioperative analgesia has traditionally been provided by opioid analgesics but extensive use of opioids is associated with a variety of perioperative side effects, such as respiratory depression, drowsiness and sedation, postoperative nausea and vomiting, pruritus, urinary retention, ileus and constipation, thus can delay hospital discharge and excessive use of postoperative opioids analgesics can lead to decrease patient satisfaction [7]. In addition, the use of conventional method of administration of opioids in standard prescribed doses may be too large (causing side effects), or too small (causing inadequate analgesia).

Therefore, anaesthesiologists are increasingly turning to non-conventional techniques as adjuvant for managing pain during the

perioperative period to minimize the adverse effects of analgesic medications as well as increase patient satisfaction [8].

Intraperitoneal instillation of local anaesthetic in combination with general anaesthesia has been investigated in several interventional studies during laparoscopic cholecystectomy. Approximately half of these studies showed reduction in the postoperative pain significantly. Intraperitoneal route of administration of a local anaesthetic is a cheap, easy and non-invasive method of reducing the intensity of post-laparoscopy pain [9].

The main advantages of using intraperitoneal instillation of local anaesthetic are that they do not have adverse effects of Opioid. Many authors have used intraperitoneal 0.5% ropivacaine for post-operative pain relief after laparoscopic cholecystectomy [10, 11]. In view of the results obtained by other authors the present study was carried out to compare the post-operative analgesic effect of intraperitoneal instillation of ropivacaine 0.5% and ropivacaine 0.5% with dexmedetomidine (1µg/kg) in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

**MATERIALS AND METHODS**

After institutional ethical committee approval, the present study was conducted in the Department of Anaesthesia; Government R. D. B. P. Jaipuria Hospital (attached to RUHS CMS) on patients undergone laparoscopic cholecystectomy. It is a randomized, double-blind prospective study. Randomization of patients was done by computer-generated random numbers obtained from [www.random.org](http://www.random.org) were used.

Sample size was calculated as 80% study power and alpha error of 0.05 assuming SD of 0.94 VAS score in 24 h in the ropivacaine group

as found in reference study (Chiruvella S et al. 2016) [12]. 39 patients in each group are required sample size, which is further enhanced to 43 patients in each group as final sample size for present study, expecting 10% dropout/attrition. Patient who were allergic to local anaesthetics or suffering with acute cholecystitis or with severe cardiac, pulmonary, neurological diseases were excluded from study. Patients were divided in two groups-

Group R-Patients received 20 ml 0.5% isobaric ropivacaine hydrochloride+5 ml NS.

Group RD-Patients received 20 ml 0.5% isobaric ropivacaine hydrochloride with 1µg/kg dexmedetomidine hydrochloride. Solution was diluted with normal saline to make a total volume 25 ml.

Study drugs were prepared by an Anaesthesiologist not involved in the study and the anaesthesiologist observing the patient was unaware of the study group. At the end of the surgery, study solution was given Intraperitoneally (In group R-Ropivacaine 20 ml of 0.5%+5 ml saline and in group RD-20 ml of 0.5% Ropivacaine+dexmedetomidine 1µg/kg) before removal of trocar in Trendelenberg's position under direct laparoscopic control.

Postoperatively, the patient was assessed for pain using the visual analogue scale (VAS) at 1/2 h then 2, 4, 8, 12 and 24 h from time of

installation of the drug. Before induction, all the study patients were explained how to use VAS. Time to first analgesic requirement, total analgesic consumption in the first 24 h postoperatively and occurrence of adverse events were also be recorded. The patients with VAS≥ 3 were given diclofenac 75 mg intramuscularly as a rescue analgesic.

**Statistical analysis**

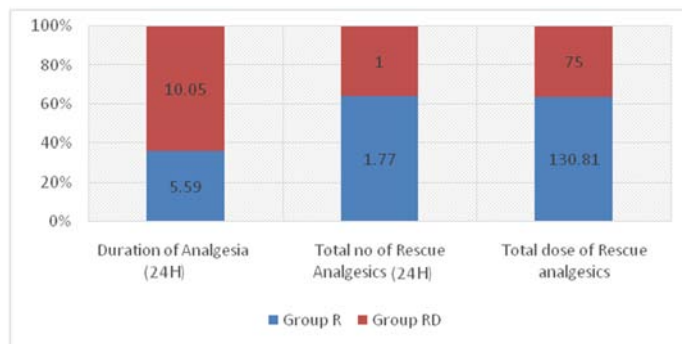
Continuous data were summarised as mean and SD and analysed with an unpaired t-test. Nominal/categorical variables were expressed as proportions (%) and were analysed by using the chi-square test. P value<0.05 was taken as significant. Med Calc 16.4 version software was used for all statistical calculations.

**RESULTS**

Hemodynamic variables (NI BP, Heart Rate, SPO2, EtCO2) were statistically similar at different time intervals among both the groups. Mean duration of analgesia was significantly higher in group RD (10.05±6.916 h) as compared to group R (5.59±6.8) (p=0.003). Mean number of rescue analgesics in 24 h was significantly higher in group R (1.77±0.812) as compared to group RD (1±0.488) (p<0.001). Mean dose of rescue analgesia was significantly higher in group R (130.81±61.44) as compared to group RD (75±36.6) (p<0.001) [table 1].

**Table 1: Requirement and duration of analgesia in both groups**

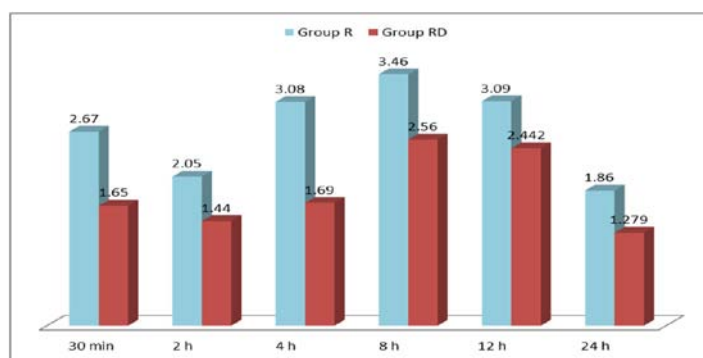
Analgesia	Group R		Group RD		P value
	Mean	SD	Mean	SD	
Duration of analgesia (h)	5.59	6.8	10.05	6.916	P=0.003
Total no of rescue analgesics in 24 h	1.77	0.812	1	0.488	P<0.001
Total dose of rescue analgesics	130.81	61.44	75	36.6	P<0.001



**Fig. 1: Requirement and duration of analgesia in both groups**

VAS score at 30 min, 2 h and 4 h were significantly higher in group R as compared to group RD (P value<0.05). At 8 h and 12 h mean VAS score was higher in group Ras compared to group RD but this

difference was statistically not significant (p>0.05). Once again at 24 h mean VAS score was significantly higher in group R (1.86±0.966) as compared to group RD (1.279±0.629) (p=0.001) [table 2].



**Fig. 2: VAS score at different time intervals**

Table 2: VAS score at different time duration

VAS score	Group R		Group RD		P value
	Mean	SD	Mean	SD	
30 min	2.67	2.009	1.65	1.289	P=0.006
2 h	2.05	1.344	1.44	1.259	P=0.034
4 h	3.08	2.204	1.69	1.456	P<0.001
8 h	3.46	2.153	2.56	2.141	P=0.053
12 h	3.09	1.962	2.442	1.722	P=0.106
24 h	1.86	0.966	1.279	0.629	P=0.001

Shoulder tip pain was found in one case (2.33%) in each group that was statistically similar ( $p=0.474$ ). Post-operative nausea/vomiting was higher in R group (4 cases, 9.3%) than RD group (one case, 2.33%), but

this difference was not found statistically significant ( $p=0.357$ ). No case of intravascular injection or Local anaesthetic systemic toxicity was observed in both R group and RD group (table 3).

Table 3: Adverse effects in both groups

Adverse effect	R group (N=43)		RD group (N=43)		P value
	n	%	n	%	
Shoulder tip pain	1	2.33	1	2.33	0.474
Post-operative nausea/vomiting	4	9.30	1	2.33	0.357

## DISCUSSION

Laparoscopic cholecystectomy results in less postoperative pain as compared with open cholecystectomy and pain may be mild or moderate or even severe for some patients. In laparoscopic surgeries the raised intraperitoneal pressure as consequence of gas insufflation leads to peritoneal inflammation and neuronal rupture and are strong predictors of the severity of the postoperative pain. Therefore, we opted for an intraperitoneal route for local anaesthetic, as these agents has an inhibitory effect on visceral afferent signals therefore the perception of pain is suppressed. The local anaesthetic provides analgesia by virtue of its effect on nerve membrane and, secondly, decreased release of prostaglandins, which is primarily responsible for inflammation [13]. However, absorption from large peritoneal surface may also occur, which may be a further mechanism of analgesia.

Application of peritoneal instillation of ropivacaine before the creation of pneumoperitoneum decreases postoperative pain as shown in the studies conducted by Berczynski *et al.* and Maestroni *et al.* Maestroni *et al.* also observed that pain was significantly less in patients who received ropivacaine as compared to saline before creation of pneumoperitoneum [14, 15].

Narchi *et al.* found that IP instillation of local anaesthetics are more effective in reducing pain upto 48 h postoperatively in patients undergoing diagnostic laparoscopy [16].

Keeping in view the results obtained by other authors the present study was carried out to compare the post-operative analgesic effect of Intra peritoneal instillation of ropivacaine 0.5% and ropivacaine 0.5% with dexmedetomidine 1 $\mu$ g/kg in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

The results of our study favoured the combination of ropivacaine and dexmedetomidine in preventing pain and reducing the need for postoperative analgesic through intraperitoneal instillation per se or along with pre-incisional local infiltration. We observed that intravenous dexmedetomidine resulted in decreased requirement of analgesics and anaesthetics in the intraoperative period. The analgesic efficacy of dexmedetomidine is due to its action at the level of dorsal root neuron, leading to decreased release of substance P. Dexmedetomidine also have effect on inhibitory G protein, resulting in increased conductance through the potassium channels [17].

The results of the present study suggested that the IP instillation of ropivacaine combined with dexmedetomidine was more effective in reducing pain immediately after operative laparoscopy when compared with the IP instillation ropivacaine alone but the limitation of the present study is the postoperative pain, which is a subjective experience and can be difficult to quantify objectively when comparing various treatment options.

## CONCLUSION

Our study concluded that intraperitoneal Ropivacaine with Dexmedetomidine produced better postoperative analgesia as well as reduced the total dose of rescue analgesic consumption without any significant increase in adverse events than with intraperitoneal ropivacaine alone.

## FUNDING

Nil

## AUTHORS CONTRIBUTIONS

All authors have contributed equally

## CONFLICTS OF INTERESTS

There are no conflicts of interest

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