Original Research Article

Study of post-operative analgesic effect of intraperitoneal ropivacaine with or without tramadol in laparoscopic cholecystectomy

Priyanshu Sharma[1], Lalit Mohan Negi[2], Jassa Ram Thakur[3], Ambika Negi[4*]

[1]Department Of Health And Family Welfare Hp Government, Operation Theatre Incharge Civil Hospitaltheog, District Shimla Himachal Pradesh, INDIA.
[2]Senior Resident, Department Of OBG Igmc Shimla, INDIA.
[3]Department Of Anaesthesia, SLBSMC Nerchok District Mandi (H.P), INDIA.
[4]Indira Gandhi Medical College Shimla Himachal Pradesh, INDIA.
Email: priyanshusharma27@gmail.com, ambikanegi88@gmail.com

Abstract

Background: Laparoscopic cholecystectomy is commonly performed procedure. Pain results from stretching of intra-abdominal cavity, peritoneal inflammation, and diaphragmatic irritation caused by residual carbon dioxide in peritoneal cavity. Use of intraperitoneal local anesthetics for postoperative pain relief in laparoscopic surgery provides adequate analgesia without any side effect unlike intravenous opioids. In present study we compared post-operative analgesic effect of intraperitoneal ropivacaine with or without tramadol in laparoscopic cholecystectomy at our tertiary hospital. **Material and Methods:** Present study was a prospective, comparative study conducted in patients 19–65 years age, of either sex, posted for elective laparoscopic cholecystectomy, ASA (American Society of Anaesthesiologists) physical status grade I/II, willing to participate in study. In surgical theater, pre-operatively patients were randomised into two groups (group R and group RT) by chit method. Group R received intraperitoneal 20 ml solution (18 mL of 0.5% ropivacaine +2 mL of normal saline). Group RT received intraperitoneal 20 ml solution {18 mL of 0.5% ropivacaine IP + 2 mL (100 mg) tramadol}. Chi-square test and Mann Whitney U test were used. p value less than 0.05 was considered statistically significant. **Results:** In present study total 60 patients were studied. 30 patients each were allocated to each group (group R and group RT). General characteristics such as age, gender, height, weight, ASA status were comparable in both groups and difference was not statistically significant. Time for first analgesia request (in minutes) and amount of paracetamol needed (gm) was more in group R as compared to group RT, difference was statistically significant. **Conclusion:** Intraperitoneal ropivacaine with tramadol produces better postoperative analgesia, reduces total dose of rescue analgesic consumption than with intraperitoneal ropivacaine alone.

Keywords: Laparoscopic cholecystectomy, ropivacaine, tramadol, VAS Analgesia.

[*]**Address for Correspondence:**
Dr Ambika Negi, Indira Gandhi Medical College Shimla Himachal Pradesh, INDIA.
Email: ambikanegi88@gmail.com

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INTRODUCTION

Laparoscopic cholecystectomy is commonly performed procedure for treating symptomatic gallstones. Laparoscopic procedures have revolutionized modern surgeries and have almost replaced traditional open surgeries. It has many advantages over open surgeries, with smaller and more cosmetic incisions, reduced blood loss, reduced pain, early mobility, and early enteral feed, hence there will be reduced hospital stay.[1] Pain results from stretching of intra-abdominal cavity, peritoneal inflammation, and diaphragmatic irritation caused by residual carbon dioxide in peritoneal cavity.[2] Poorly

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managed pain can slow recovery, creates burden for patients and their families, and also increases the cost to the health-care system. There are various modalities available for postoperative pain relief ranging from parenteral analgesia (NSAIDS and opioids), epidural analgesia, peripheral nerve blocks, incisional infiltration and intraperitoneal instillation using local anaesthetics.[3,4] Use of intraperitoneal local anesthetics for postoperative pain relief in laparoscopic surgery provides adequate analgesia without any side effect unlike intravenous opioids. Intraperitoneal instillation of local anesthetic agents alone or in combination with opioids, tramadol, α-2 agonists (clonidine) and dexmedetomidine has been found to reduce post-operative pain following laparoscopic surgeries.[5,6] Ropivacaine is a long-acting amide local anesthetic, chemically related to bupivacaine, but it has been shown to be less toxic to cardiac and central nervous systems. In present study we compared post-operative analgesic effect of intraperitoneal ropivacaine with or without tramadol in laparoscopic cholecystectomy at our tertiary hospital.

MATERIAL AND METHODS

Present study was a prospective, comparative study conducted in department of anaesthesiology and department of surgery. Study duration was of 1 year (September 2019 to August 2020). Approval was taken from institutional ethics committee.

Inclusion criteria

Patients 19–65 years age, of either sex, posted for elective laparoscopic cholecystectomy, ASA (American Society of Anaesthesiologists) physical status grade I/II, willing to participate in study

Exclusion criteria

- Patients needing bile duct exploration, insertion of a T-drain or patients with acute cholecystitis
- Pregnant females, patients with malignancy, alcohol or drug abuse
- Patients with a history of hypersensitivity to ropivacaine/tramadol
- Not willing to participate

Study was explained to patients during pre-anaesthetic evaluation and written informed consent was taken for participation. Visual analogue scale was also explained. Clinical details, laboratory/ radiological findings were noted.

Standard pre-operative monitoring was done for blood pressure (NIBP), peripheral oxygen saturation (SpO2), end-tidal carbon dioxide (EtCO2), ECG, and heart rate. All patients were operated under general anaesthesia with isoflurane and oxygen. Neuromuscular blockade was maintained by the top-up doses of vecuronium (0.01 mg/kg) IV when required. Intravenous paracetamol 1 gm was given intraoperatively. Intravenous dexamethasone 8 mg at the induction of anaesthesia and ondansetron 4 mg IV during skin closure was administered. At the end of the surgery, before the removal of the trocar, 20 ml local anaesthetic solution was instilled through the ports. The study drug according to the group allocation was instilled over the gall bladder bed, hepato-duodenal ligament and hepatodiaphragmatic space by the operating surgeon who was blinded to the study drug. After instillation, to obtain thorough diffusion of LA, 2 min of Trendelenburg position was maintained.

In surgical theater, pre-operatively patients were randomised into two groups (group R and group RT) by chit method.

- Group R received intraperitoneal 20 ml solution (18 mL of 0.5% ropivacaine +2 mL of normal saline)
- Group RT received intraperitoneal 20 ml solution {18 mL of 0.5% ropivacaine IP + 2 mL (100 mg) tramadol}

The reversal of neuromuscular blockade was done with neostigmine 0.05 mg/kg IV and glycopyrrolate 0.01 mg/kg IV. Duration of analgesia was defined as the time duration from completion of surgery to the time patient requested for first analgesic medication. Intravenous paracetamol 1 gm, 12 hourly in the first 24 h were given to all patients. VAS score was collected postoperatively at 1,4,8,12,16 and 24 hourly. Cumulative consumption dose of rescue analgesia over 24 h was recorded. Side effects such as nausea, vomiting and shoulder pain were also recorded. Data was collected, entered in Microsoft excel sheet, analysed using statistical package for the social sciences (SPSS) version 21.0. Chi-square test and Mann Whitney U test were used. p value less than 0.05 was considered statistically significant.

RESULTS

In present study total 60 patients were studied. 30 patients each were allocated to each group (group R and group RT). General characteristics such as age, gender, height, weight, ASA status were comparable in both groups and difference was not statistically significant. Time for first analgesia request (in minutes) and amount of paracetamol needed (gm) was more in group R as compared to group RT, difference was statistically significant.

Table 1: General characteristics and postoperative analgesia.

Parameter	Group R (n=30) (mean ± SD/ no. of patients)	Group RT (n=30) (mean ± SD/ no. of patients)	P value
Age (in years)	46.6 ± 12.4	47.4 ±10.6	0.66
Gender			0.69
Male	17 (57%)	16 (53%)	
Female	13 (43%)	14 (47%)	
Weight (kg)	57.3 ± 12.1	58.8 ± 11.3	0.49
Height (cm)	162.7 ± 10.2	161.2± 9.6	0.57
ASA status			0.72
I	19 (63%)	20 (67%)	
II	11 (37%)	10 (33%)	
Duration of surgery (minutes)	66.5 ± 12.9	68.2 ±14.4	0.4
Postoperative analgesia			
Time for 1st analgesia request (in minutes)	178.6 ± 37.9	291.8 ± 39.1	0.024
Amount of Paracetamol needed (gm)	2.9 ± 0.6	1.3 ± 0.9	0.031

We compared pain severity by visual analogue score (VAS) at postoperative 1,4,8,12,16 and 24 hours. Postoperative pain was less in group R as compared to group RT throughout postoperative period, difference was statistically significant. No postoperative complications such as nausea, pruritis, shoulder pain was noted in any group.

Table 2: VAS (Visual analogue score).

Time (hours)	Group R	Group RT	P value
1	6.1 ± 1.3	3.9 ± 1	0.024
4	5.8 ± 1	3.2 ± 0.6	0.017
8	5 ± 1.5	3.3 ± 0.9	0.027
12	4.4 ± 1.1	2.7 ± 0.7	0.032
16	5.1 ± 1.2	3.4 ± 0.9	0.026
24	3.9 ± 1	2.8 ± 0.8	0.039

DISCUSSION

Pain experienced following laparoscopic cholecystectomy derives significantly from the incisions made in the anterior abdominal wall which has segmental innervation provided by nociceptor afferents in the transversus abdominis fascial plane between the internal oblique and transversus abdominis muscles.[8] The improved understanding of origin of abdominal and shoulder pain after laparoscopic procedures led to the use of intra peritoneal and port site instillation of local anaesthetic to reduce postoperative pain. Effective pain management provides early ambulation and ability to take deep breaths which significantly reduces the risk of deep vein thrombosis, atelectasis and pulmonary embolism. Lower abdominal pressures and shorter duration of surgery are associated with lower incidence and severity of shoulder pain after LC and therefore surgical method influences postoperative referral pain. The addition of opioids to local anaesthetics for postoperative pain, results from a truly peripheral rather than a central site of action. It has been postulated that inflammatory hyperalgesia is especially amenable to peripheral antinociception.[9,10] Prashant S, studied equal volumes of different concentrations of ropivacaine in the form of preclosure periportal instillation in laparoscopic cholecystectomy and noted that concentration of Ropivacaine 0.5% was able to achieve satisfactory postoperative analgesia and reduced the need for rescue analgesics. Lower concentrations of Ropivacaine (0.25% and 0.125%) were not effective in providing adequate postoperative analgesia and were no more effective than normal saline.[11] Therefore in present study we used 0.5% ropivacaine for intraperitoneal instillation. Kumari A *et al.*,[12] in a similar study noted that mean NRS score was maximum till 2 h after surgery in both the groups. A significant difference in the mean NRS score was observed among the two groups at 2.5, 3, 3.5, 4, 6, 12, 24h ($P < 0.05$). The requirement of rescue analgesia (fentanyl) was high er in Group R (75%) compared to Group RT (42.5%), difference was statistically significant. Minimum time to receive first rescue analgesia was 5 min in Group R and 10 min in Group RT, difference was not statistically significant. The median total analgesic consumption (TAC) in Group R was 40 µg and Group RT was 0 µg , difference was statistically significant. Total analgesic consumption summated in Group R was 1800 µg and Group RT was 785 µg. Similar findings were noted in present study. Gupta *et al.*[13] concluded that ropivacaine 70 ml (0.25%) infiltrated into cholecystectomy wounds significantly decreases wound pain and increases time until the first request of post-operative analgesia, without any side effect attributable to ropivacaine. Memis *et al.*,[14] studied the effects of tramadol or clonidine added to

intraperitoneal bupivacaine, on postoperative pain in total abdominal hysterectomy and found that combination of tramadol or clonidine with intraperitoneal bupivacaine to be more effective than bupivacaine alone. Peripheral antinociceptive effect of opioids occurs due to interaction of opioids with opioid receptor located on peripheral intact perineurium that prevents the entry of hydrophilic opioid molecule, such as morphine while lipophilic opioids, such as tramadol, buprenorphine can diffuse across the intact perineural barrier, which results in better analgesia on intraperitoneal administration. Intraperitoneal administration of local anaesthetic has also been shown to reduce nausea and vomiting. By intraperitoneal administration peritoneum is exposed to block the visceral nociceptive conduction from the area of tissue damage and the peritoneum, thereby providing an additional mechanism of analgesia.[15] Intraperitoneal instillation of local anesthetic is an easy, cheap and noninvasive method that provides good analgesia in the immediate postoperative period after laparoscopic cholecystectomy. Limitations of present study were small sample size.

CONCLUSION

Ropivacaine and tramadol provides a more profound analgesia as compared to ropivacaine alone. Intraperitoneal ropivacaine with tramadol produces better postoperative analgesia, reduces total dose of rescue analgesic consumption than with intraperitoneal ropivacaine alone.

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