INTRAPERITONEAL INFILTRATION OF ROPIVACAINE FOR POST-OPERATIVE ANALGESIA IN OPEN CHOLECYSTECTOMY

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ABSTRACT

Objective: To assess the role of Intraperitoneal infiltration of Ropivacaine for post-op analgesia in open cholecystectomy in a low resource setting.

Study Design: Randomized controlled trial.

Place and Duration of Study: Study was conducted at department of Anesthesia, Scouts Hospital Chitral, from Jul 2014 to Jun 2016.

Material and Methods: After taking approval from hospital ethical committee, total 126 patients were divided randomly in two groups. Group I (study group) was given intraperitoneal ropivacaine and group II (control group) was given routine standard analgesia. After complete recovery, pain was measure on VAS score (1-10) at 1 hour, 6 hour and 24 hour in all patients. Patients having pain score of 4 or more were managed with nalbuphine 5 mg IV bolus. Data was analyzed by SPSS version 16.

Results: The comparison of pain score (after 1, 6and 24 hours of surgery), showed that study group had significantly (p-value<0.05) less mean pain score as compared with placebo group. Significant rate of nausea/vomiting was observed (p-value<0.05) higher (62%) in placebo group as compared with (38%) in study group. Statistically there was no significant difference (p-value>0.05) between groups on the basis of mean age (47.89 ± 8.56 vs. 48.75 ± 9.36), gender (Females 70% vs. 68%), duration of the surgery (88.54 ± 12.34 minutes vs. 91.70 ± 13.50 minutes) and American society of anesthesiologist (ASA) grades in study and placebo group patients respectively.

Conclusion: Intraperitoneal ropivacaine infiltration helped in reducing the post op pain significantly in open cholecystectomy.

Keywords: Intraperitoneal ropivacaine, Open cholecystectomy, Postop pain.

INTRODUCTION

Gall bladder disease is being treated with open cholecystectomy for more than a century now. With much advancement in medical sciences, especially with the introduction of laparoscopy in 1990, the treatment for cholelithiasis has been modified. Nowadays laparoscopic cholecystectomy is considered as preferred option for cholelithiasis in all developed setups[1,2].

The laparoscopic technique requires specialized equipment and expertise. Unavailability of these in Pakistan's remote areas, the only surgical option available for gall bladder disease is open cholecystectomy[3].

The postoperative pain can cause many dysfunctions related to surgery like pulmonary, gastrointestinal, circulatory and urinary dysfunctions, which has adverse affects on the quality of life of patient. The surgeries done in upper abdomen, like open cholecystectomy, cause severe acute postoperative pain and respiratory failure. These dysfunctions can cause delay in recovery of the patient, increase hospital stay as well as cost of health care. These can even produce severe morbidity and mortality in the patients[4].

With innovation of modern techniques and technologies, the surgical procedures have improved substantially, which consequently have reduced the trauma morbidity and mortality related to different surgical procedures. These

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advancements also have considerably reduced the hospital stay and subsequently reduction in health care costs. Many approaches have been in practice to reduce postoperative pain by using different opioid and non-opioid analgesics for best control of postoperative pain and minimizing adverse events[5].

Many clinical trials have been planned to find out the usefulness of intraperitoneal local anaesthetics and opioids for postoperative pain control. The commonly used anaesthetics are bupivacaine, ropivacaine and morphine and these are administrated after cholecystectomy surgery. The intraperitoneal use of bupivacaine and/or tramadol has been resulted in much lower pain scores in different studies[7-9]. Many previous researchers have found that intraperitoneal use of different drugs (tenoxicam, fentanyl, lignocaine) can be helpful in relieving or reducing postoperative pain. Some authors are in favor of using the intraperitonial drug at the end of the surgery[6].

Patients undergoing open cholecystectomy frequently suffer from nausea and vomiting. Reduction in nausea/vomiting in these patients is helpful in fast recovery of the patient and in minimizing hospital stay. Many researches support that intraperitoneal administration of tramadol and/or bupivacaine or ropivacaine has showed very good results in reducing nausea and vomiting[10].

The postoperative use of local anesthetics like ropivacaine administrated intraperitoneally can accelerate the recovery process of the patient and reduce the morbidity and mortality related to postoperative pain by dampening the autonomic, somatic and endocrine reflexes. This study was conducted in our setup to investigate the role of intraperitoneal infiltration of ropivacaine as postoperative analgesia in open cholecystectomy.

MATERIAL AND METHODS

This randomized controlled trial study was started after taking approval from hospital ethical committee. All patients with uncomplicated gallbladder disease reported to Scout Hospital Chitral for open cholecystectomy were included. Patients with age ranging from 20 to 50 years of both genders were included by non-probability consecutive sampling. This randomized controlled trial study was conducted from July 2014 to June 2016 for duration of two years at department of Anesthesia and Intensive care Scout Hospital Chitral. In this study a total 126 patients were included consisting of 63 patients in each group divided randomly by random number tables. The sample size was calculated by using WHO sample size calculator with 5% level of significance, 80% power of test, population standard deviation of 8 along with population mean VAS score of 3 in study group, and 7 in control group[11]. All the patients were briefed about the purpose of the study and method of the study protocol to get informed written consent from each patient. Those patients were included in the study who gave consent to be the part of the study. Study group was labeled as group I and was given intraperitoneal ropivacaine (0.5% ropivacaine in a dose of 2 mg/kg diluted in normal saline to make total volume of 50 ml)as an analgesic and group II was the control group which was managed with routine standard analgesia (Nalbuphine 10 mg or Ketorolac 30 mg) treatment.

As per American society of anesthesiologists (ASA) standards, detailed clinical examination was done for each patient; information regarding history of any medical illness or previous surgery was taken. Routine laboratory investigations including blood CP, Chest radiograph along with renal profile and liver functions test were done. All the patients were gone through standard procedure of open cholecystectomy by same team of consultant surgeon.

Both groups were given general anesthesia with propofol 2-2.5 mg/kg as an i.v induction agent and atracurium with initial dose of 0.4-0.5 mg/kg i.v over 60 seconds for muscle relaxation was given. All patients were intubated in deep plane of anesthesia. Placebo group (group-II) was given intravenous analgesia drugs including nalbuphine 10 mg or ketorolac 30 mg for

postoperative pain management. Isoflurane in 66% nitrous oxide and oxygen along with atracurium (0.08-0.1 mg/kg 20-45 minutes after initial dose) was used to maintain the anaesthesia. The recommendations of American society of anesthesiologist were followed to monitor the patients. Neostigmine and glycopyrrolate were used to reverse the neuromuscular paralysis after the end of the surgery. The patients were monitored carefully till complete recovery then were shifted to post anaesthesia care unit. Nalbuphine 5 mg IV bolus was given additionally to those patients having pain score of four or more.

Pain was evaluated by a visual analogue score (VAS) of 0 to 10 (0=no pain, 10=extreme amount of pain), that was explained to the patients consented to be studied during the preoperative visit. Information regarding demographic characteristics was taken along with postoperative pain and requirement of postoperative analgesia. The information relating to postoperative nausea and vomiting, sedation, headache, respiratory depression and visual disturbances were also noted on a predesigned performa.

All the collected data were entered and analyzed by using SPSS version 16. Mean and standard deviation was used for qualitative variables and frequency and percentages were calculated for qualitative variables. Independent sample t-test was applied to compare mean values of quantitative data and chi-square test was used to compare proportions of qualitative data between both groups. A *p*-value <0.05 was taken as significant.

RESULTS

In this study 126 patients were randomized in two equal groups.There was no statically significant difference in mean age of patients of both groups (mean age 47.89 ± 8.56 in study group and 48.75 ± 9.36 in placebo group) and gender distribution of both groups (*p*-value >0.05). Female had dominance in both groups having (69.84%) female in study and (68.25%) female in placebo group. Majority of the patients in both groups were having ASA grade II, and there was no statistically significant (*p*-value >0.05) difference between both groups. Although mean operation time (91.70 ± 13.50) was slightly higher in placebo group than mean operation time (88.54 ± 12.34) minutes in study group but this difference was also insignificant (*p*-value >0.05) (table-I).

Table-I: Comparison of demographic characteristics between both groups.

Characteristics	Ropivacaine	Placebo	*p*-value
Age of Patient			
Mean ± SD	47.89 ± 8.56	48.75 ± 9.36	0.593
Gender of the Patient			
Female	44 (70%)	43 (68%)	0.847
Male	19 (30%)	20 (32%)	
ASA Grade			
ASA – I	19 (30%)	15 (24%)	0.176
ASA – II	39 (62%)	36 (57%)	
ASA – III	5 (8%)	12 (19%)	
Operation Time (Minutes)			
Mean ± SD	88.54 ± 12.34	91.70 ± 13.50	0.173

The comparison of pain score after 1 hour, 6 hours and 24 hours of surgery showed that study group (Ropivacaine group) had significantly (*p*-value <0.05) less mean pain score as compared to placebo group (5.79 ± 1.21 vs. 7.00 ± 1.30 after 1 hour, 5.27 ± 1.03 vs. 4.33 ± 1.09 after 6 hours and 2.62 ± 0.71 vs. 3.56 ± 0.86 after 24 hours of surgery respectively) (table-II).

The patients were monitored for other complications like, nausea/vomiting and it was observed that the patients in placebo group had significantly higher rate of complications. The rate of nausea/vomiting was observed significantly (*p*-value<0.05) higher 39 (62%) in placebo group as compared with 24 (38%) Ropivacaine group. There was no significant (*p*-value >0.05) difference in hospital stay of both groups. The mean hospital stay in study group was noted 5.63 ± 1.235 days and in placebo group it was seen 5.46 ± 1.366 days (table-III).

study because of undesired surgical complication or signs of local anesthetic toxicity such as brady-cardia or hypotension or due to uncontrolled pain.

Among many analgesics like nalbuphine, ketorolac or fentanyl which are commonly used intravenously for control of postoperative pain, the intraperitoneal ropivacaine has shown better results in comparison of these i.v analgesics. The use of intraperitoneal ropivacaine has also shown better efficacy without any significant increase in adverse events to reduce the postoperative pain

Table-II: Comparison of pain score at 1, 6 and 24 hours between both groups.

Pain	Group	N	Mean	Std. Deviation	*p*-value
Pain score at 1 hour	Ropivacaine	63	5.79	1.21	<0.001
	Placebo	63	7.00	1.30	
Pain score at 6 hours	Ropivacaine	63	4.33	1.09	<0.001
	Placebo	63	5.27	1.03	
Pain score at 24 hours	Ropivacaine	63	2.62	0.71	<0.001
	Placebo	63	3.56	0.86	

Table-III: Comparison of complications and hospital stay between both groups.

Complications	Group		Total	*p*-value
	Ropivacaine	Placebo		
Nausea/Vomiting				
Yes	24 (38%)	39 (62%)	63	0.008
No	39 (62%)	24 (38%)	63	
Total	63	63	126	
Hospital stay (Days)				
	5.63 ± 1.235	5.46 ± 1.366		0.464

DISCUSSION

In this study the comparison of pain score after one hour of surgery showed that ropivacaine group had significantly (*p*-value <0.05) less mean pain score (5.79 ± 1.21 vs. 7.00 ± 1.30) as compared to placebo group. The mean pain score at 6 hours was significantly (*p*-value <0.05) higher in placebo group (5.27 ± 1.03) as compared with ropivacaine group in which the mean pain score was noted (4.33 ± 1.09) after 6 hours of surgery. After 24 hours of surgery, it was noted that ropivacaine had significantly (*p*-value <0.05) less mean pain score (2.62 ± 0.71) as compared with (3.56 ± 0.86) placebo group. No patients were excluded from after cholecystectomy surgery[12].

The main cause of postoperative pain after open cholecystectomy is a result of injured soft tissues and stimulation of sensory nerves especially in the area of skin incision. The tissues also respond in the form of inflammation due to release of inflammatory mediators with systemic effect, in the result of tissue damages[13].

The control of postoperative pain is very crucial because it can cause many complications including pulmonary dysfunction, metabolic and inflammatory responses and their relation with hemodynamic changes, physiological changes caused by endocrine, diaphragmatic dysfunction

and spinal reflex spasms. Pain management in major surgical procedures, like open cholecystectomy, is more important because it can affect the respiratory system adversely. The incision for open cholecystectomy is given in an area which hampers the respiratory movements which causes poor cough reflex and leads to atelectasis and pneumonia[14]. The effective control of postoperative pain can facilitate the prompt recovery and reduce the duration of hospital stay. Various methods have been employed to control postoperative pain including patient controlled analgesia (PCA), epidural anesthesia and wound infiltration of local anesthetics as well as intraperitoneal infiltration of local anesthetics[15-18].

The results in our study are comparable to the results of a study conducted in India in which bupivacaine is compared with pathidine. In that study pain scores between 30 to 360 minutes on the basis of VAS score were very similar to the results of our study[19]. In our study ropivacaine is used instead of bupivacaine. Ropivacaine has same efficacy as compared to bupivacaine but due to reduced lipophilicity it is less cardio toxic and neurotoxic[20]. Similar results are also concluded in studies conducted by Singh et al[13], Shukla et al[21], Ahmed et al[22], and Singh et al[24].

The rate of nausea/vomiting was observed significantly (p-value <0.05) higher 39 (62%) in placebo group as compared with 24 (38%) ropivacaine group. The results of this study are better in contrast to previous studies who has reported higher rate of nausea/vomiting frequency. Although adverse events were mainly related to placebo group[23].

Results of hospital stay in both groups were identical on average. There was no significant (p-value> 0.05) difference in hospital stay of both groups. The mean hospital stay in study group was noted 5.63 ± 1.235 days and in placebo group it was seen 5.46 ± 1.366 days, these results are comparable to previous studies[24].

In open cholecystectomy procedure the results of present study support that the use of Intraperitoneal ropavocaine is very beneficial to control postoperative pain, and reducing the complication like shoulder tip pain and nausea/vomiting after open cholecystectomy. Although no any apparent difference was noted in the length of hospital stay.

CONCLUSION

It is concluded that intraperitoneal infiltration of ropavocaine can be used as a very effective postoperative analgesia in patients undergoing open cholecystectomy.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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