Open Access Journal

Indian Journal of Medical Research and Pharmaceutical Sciences

March 2015; 2(3) ISSN: 2349–5340

EFFICACY OF INTRA PERITONEAL AND PORT SITES ADMINISTRATION OF BUPIVACAINE ON POSTOPERATIVE PAIN FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY – A RANDOMIZED CLINICAL TRIAL

Tata. V. S. Ramprasad

Department of surgery, NRI Medical college, Chinnakakani, Guntur district, Andhra pradesh, India

Keywords:
Laparoscopic cholecystectomy, Bupivacaine, Post operative pain.

Abstract

Background: Effective control of postoperative pain reduces the postsurgical discomfort and facilitates early ambulation. We evaluated the efficacy of trocar sites and intra peritoneal administration of bupivacaine in reducing the postoperative pain and analgesic requirement.

Materials and methods: Sixty adult ASA physical status I to III patients undergoing laparoscopic cholecystectomy were randomly assigned to receive either, 30 ml of 0.25% bupivacaine at gall bladder bed plus 20 ml of 0.25 % bupivacaine at trocar sites (Group B) or an equal volume of normal saline (Group S). Postoperative pain was assessed using 10 point Visual analogue scale every four hours for 12 hours. The total analgesic consumption in 12 hours was also assessed.

Results: The mean pain total pain score were significantly less (< 0.0001) in Group B (2.03±0.9289) when compared to Group S (4.266±0.4767). Total tramadol consumption decreased by 56% in Group B (113.33 ± 34.57mg) compared to Group S (256.66 ± 50.4 mg).The variation was statistically significant($p < 0.0001$). Total consumption of diclofenac was significantly ($p < 0.0001$) less in Group B than Group S (7.5±22.884 Vs 55±33.733mg).

Conclusion: Local anaesthetic administration is an effective component of multimodal analgesia for reducing postoperative pain and opioid requirement after laparoscopic cholecystectomy.

Introduction

Pain is an unpleasant sensory or emotional experience due to actual or potential tissue damage or described in terms of such damage. It can range from mild localised discomfort to agony. Though postoperative pain is less intense after laparoscopic than an open surgery, it is not a total pain-free procedure. Incidence of symptomatic cholelithiasis is reported to be 2.2/1000 USA population with more than 500,000 cholecystectomies performed yearly[1] . Postoperative pain following laparoscopic cholecystectomy is most predominant in the first 24 hours and can persist for about 3 days[2]. Pain following laparoscopic cholecystectomy is multifactorial in etiology with visceral pain predominating the abdominal wall and shoulder pain[3]. Components of post laparoscopic cholecystectomy pain are; visceral pain (78.33%), parietal pain (70%) and shoulder tip pain (23.33%)[4].

Various modalities proposed to relieve pain after laparoscopic cholecystectomy are non steroidal anti inflammatory drugs, opioids, intra peritoneal local anesthetics, port site infiltration of local anesthetics. Local anaesthetics are effective in mitigating postoperative pain and are safe with less side effects. In this prospective randomised control trial, we used Bupivacaine a long acting aminoamie local anaesthetic containing equal proportions of S and R enantiomers[5]. The aim of our study was to evaluate the analgesic efficacy of intra peritoneal and port-site infiltration of bupivacaine in reducing postoperative pain after laparoscopic procedures in comparison with placebo.

Materials and methods

After obtaining institutional ethical committee approval and written informed consent, 60 ASA physical status 1-2 patients of either sex aged 20-60 years scheduled for laparoscopic cholecystectomy under general anesthesia were enrolled in this prospective, randomized, double-blind study. Patients with a history of allergic reaction to study drugs, history of upper abdominal surgeries, contraindication for laparoscopic surgery, and history of psychological disturbance or chronic pain before laparoscopy were excluded from the study. Patients were randomly allocated into 2 groups. The randomization was conducted by sealed envelope on patient's arrival at the operation theatre until the planned number of equivalent groups were reached. Following glycopyrrolate 0.05 mg/kg, anaesthesia was induced with 2µg/ kg of fentanyl, 0.04mg/kg midazolam and titrated doses of propofol. Endotracheal intubation was facilitated with 0.1 mg/kg of vecuronium bromide and mechanical ventilation was commenced with a tidal volume of 8 ml/kg and frequency adjusted to achieve end‑tidal carbon dioxide of 35-40 mm of Hg. Sevoflurane 1-2%, in a mixture of oxygen and nitrous oxide, was used for anesthetic maintenance. Group B(Bupivacaine) received an infiltration of 20ml of 0.25% bupivacaine at the trocar sites and installation of 30ml of 0.25% bupivacaine at the gall bladder bed after surgical resection and Group S (saline) received equal volume of 0.9% normal saline. Similar anaesthetic and operative techniques were applied in all the patients. An independent surgeon was responsible for the randomization as well as for the preparation of an unmarked syringe containing bupivacaine or saline. The operating surgeon, the staff, and the patients were blinded to this procedure. All the patients received 15mg/kg of IV paracetamol infusion after intubation. Intra abdominal pressure was limited to 12 mm Hg for cholecystectomy. Surgical drain was avoided in all the patients. Mean duration of surgery was 50 min in both the groups. The postoperative data collection was done by a resident physician. Assessment of postoperative pain was based on a 0 to 10 visual analogue scale (VAS, 0: no pain, 10: the worst imaginable pain) at 0, 4 , 8, 12 hours postoperatively. The time of arrival in the postoperative ward was defined as zero hour postoperatively. Any patient with a VAS score of 3 or above received 2m/kg of intravenous tramadol. If the patient had VAS score more than 3 or more within 6 hours of receiving tramadol, 75 mg of diclofenac sodium was administered intramuscularly. If the patient had of VAS score of more than 3 or more, 6hours after the initial dose of tramadol, 2m/kg of intravenous tramadol was readministered. Over all tramadol and diclofenac sodium consumption over 12 hours postoperatively were recorded. The primary outcome measure of the study was to compare the postoperative VAS scores between the two groups. The secondary outcome measure was to compare over all postoperative analgesic requirements between the two groups.

Statistics

Med cal c statistical software, version (13.3) was used to analyze the data. Summary statistics, mean and standard deviation were calculated for different parameters under the study. The observed results were analyzed using Chi-square test for qualitative data and student 't' test for quantitative data. A p-value of <0.05 was considered statistically significant.

Results

The study is a double blind, randomized, controlled trial. Both the groups were comparable with respect to demographic data (Table 1). Both the groups varied significantly in the fourth hourly pain scores and the mean total pain score over 12 hours ($p < 0.0001$) with less VAS score in group B than control group (Table 2). Tramadol consumption over 12hours was significantly less in group B (113.33 ± 34.57mg) compared to group S (256.66 ± 50.4mg) $p < 0.0001$ (Table 3). Diclofenac sodium consumption was also significantly less in group S than group B($p< 0.0001$) (Table 3). There was no statistically significant difference between the two groups in terms of nausea and vomiting. No patient exhibited local anaesthetic toxicity.

Table 1:Demographic data.

Parameter	Group B	Group S	p- value
Age years (mean ± s d)	41.26±11.16	42.73±16.13	0.68
Weight kg (mean ± s d)	66.31±8.06	63.23±8.91	0.16
Male/female	14/16	15/15	

Results are expressed as mean ± standard (mean ± s d) deviation or number of patients. B: Bupivacaine group, S: Normal saline group. p<0.05 considered statistically significant.

Table 2: Mean Visual analogue pain score in Bupivacaine and Saline groups.

Hours postoperative	Mean pain score in Group B	Mean pain score in Group S	p- value
0	0.733±0.5832	4.866±0.9371	< 0.0001
4	2.166±0.9128	3.9±0.8847	< 0.0001
8	2.3±0.5959	3.866±0.8193	< 0.0001
12	2.933±1.048	4.433±0.6260	< 0.0001
0-12	2.03±0.9289	4.266±0.4767	< 0.0001

Results are expressed as mean ± standard deviation. B: Bupivacaine group, S: Normal saline group. p<0.05 considered statistically significant.

Table 3: Mean analgesic consumption over 12 hours postoperatively in Bupivacaine and Saline groups.

Analgesic	Mean analgesic consumption in Group B	Mean analgesic consumption in Group S	p- value
Tramadol	113.333±34.57 mg	256.666±50.40 mg	< 0.0001
Diclofenac sodium	7.5±22.884 mg	55±33.733 mg	< 0.0001

Results are expressed as mean ± standard deviation. B: Bupivacaine group, S: Normal saline group. p<0.05 considered statistically significant.

Discussion

The results of our study showed that intra peritoneal installation and infiltration of port sites with of 0.25% bupivacaine decreased the pain for 12 hours and there will be less analgesic consumption as well. Bupivacaine has a half life of 2.5 to 3.5 hours and has been reported to provide pain control for an average of 6 hours[6] . Bupivacaine has a upper dose limit of 2.5mg/ kg body weight, and the dose used in this study was within this toxic dose limit[5].

Ayaz, et al studied 184 patients and demonstrated effective mitigation of postoperative pain by intra peritoneal installation of 50ml of 0.25 % bupivacaine (3.619 ± 0.676) at 12th hour after laparoscopic cholecystectomy when compared to normal saline group (3.837 ± 0.667). Both the groups received port site infiltration with 5ml of 0.25% bupivacaine[7]. Even though the Intra peritoneal dose used by us was far less than the dose used by Ayaz, et al , we had a significant decrease in pain. This highlights that 30ml of intra peritoneal installation is adequate to provide significant pain relief. Pain score in our study at 12th post operative hour was (2.933±1.048). Less pain score in our study could be due to more port site infiltration of local anaesthetic in our group and the variation in use of post operative analgesics. Alam M S compared an intra peritoneal installation of 20ml and port site infiltration of 20ml of 0.25% bupivacaine to placebo in 100 patients (with 50 patients in each group and found a significant decrease in VAS scores and analgesia (pethidine and phenargan) requirement in study group[6]. A similar study by Suleka, depicted the analgesic advantage of intra peritoneal installation of bupivacaine[8]. In a systemic review by Ng A, et al 7 out of 13 clinical trials demonstrated significant analgesia and reduced analgesic consumption by intra peritoneal administration of bupivacaine in the doses of 50- 200 mg in volumes of 10-100 ml[9]. Verma G R, et al studied 60 patients and divided them into 4 groups. Group A (bupivacaine-soaked Surgicel kept in gallbladder bed), Group B (bupivacaine infiltrated at trocar sites), group C (bupivacaine infiltrated into the gallbladder bed and at trocar sites, and group D (normal saline at both sites). The visceral pain was significantly less in group A. Placement of 0.5% bupivacaine soaked surgical in the gallbladder bed is effective for pain after laparoscopic cholecystectomy[10]. Rajesh Angral, et al studied randomised patients undergoing laparoscopic cholecystectomy under general anaesthesia (GA) into IV groups of 25each.Group I received intra peritoneal instillation with 15 ml of 0.375% bupivacaine and port site infiltration with 10 ml of 0.25% bupivacaine, group II received bilateral inter costal nerve block with 0.25 % bupivacaine, group III received intravenous butorphanol 20 mg/kg and group IV received analgesia with injection diclofenac sodium 75 mg intramuscular when Visual Analogue Scale (VAS) was ≥ 6 at the end of surgery. He concluded that inter costal nerve block produced effective analgesia of longer duration (9.48 + 4.44hrs) with almost negligible side effects, whereas intravenous butorphanol produced excellent analgesia but of a shorter duration

(5.04 + 1.73hrs), with slightly more incidence of nausea and vomiting. Intra peritoneal instillation and port site infiltration with bupivacaine provided comparable analgesia (6.54 + 4.63hrs) with no major side effects[11].

One limitation of our study was that the plasma concentration of bupivacaine was not studied and none of the patients exhibited features of local anaesthetic toxicity. The plasma concentration of bupivacaine should be above the 3µg/ml to produce systemic toxicity and intra peritoneal administration of 100–150 mg plain bupivacaine gives mean plasma concentration of 0.92 to 1.14 µg/ml[12]. Further studies comparing various volumes and concentrations of local anaesthetics are essential to determine the maximum allowable dose of bupivacaine for effective mitigation of pain after laparoscopic surgeries.

Conclusion

Installation of 0.25% bupivacaine on the gallbladder bed and infiltration of trocar sites significantly reduces the severity of post-operative pain and analgesic requirement in the postoperative period following laparoscopic cholecystectomy.

References

1. Kens I, Gooszen HG, Van Laarhonen CJ, Symptomic review: open, small incision or laparoscopic cholecystectomy for symptomatic cholecystolithiasis. Aliment Pharmacol Ther 2009;28(4):359-78.
2. Maharjan SK, Shrestha. Intraperitoneal and periportal injection of bupivacaine for pain after laparoscopic cholecystectomy. Kathmandu University Medical Journal (2009), Vol. 7, No. 1, Issue 25, 50-53.
3. Pankaj Shivhare, Pankaj Dugg, Harnam Singh, Sushil Mittal, Ashwani Kumar, Anand Munghate. A Prospective Randomized Trial to Study: The Effect of Intraperitoneal Instillation of Ropivacaine in Postoperative Pain Reduction in Laparoscopic Cholecystectomy. J Minim Invasive Surg Sci 2014 November; 3(4): 1-4.
4. Nicolau AE, Merlan V, Grecu I, Nicolau M, Micu B. Multimodal analgesia in elective laparoscopic cholecystectomy: a double blind randomized controlled trial. Chirurgia (Bucur) 2008 Sep- Oct;103(5):547-51.
5. Charles R. Babst and Bert N.Gilling. Bupivacaine : A Review. Anesth prog. 1978; 25(3): 87-91.
6. Alam M S, Hoque H W , Saifullah M, Ali M O. Port Site and Intraperitoneal Infiltration of Local Anesthetics in Reduction of Postoperative Pain after Laparoscopic Cholecystectomy. Medicine today 2009; 22 (1): 24-28.
7. Ayaz Gul , Imtiaz Khan , Ahmad Faraz , Irum Sabir Ali. Laparoscopic Cholecystectomy**;** The effect of intraperitoneal instillation of bupivacaine on the mean post-operative pain scores. Professional Med J 2014;21(4): 593-600.
8. Sulekha. The Effect Of Intraperitoneal Bupivacaine For Post-Operative Pain Management In Patients Undergoing Laparoscopic
Cholecystectomy- A Prospective Double-Blind Randomized Control Study. IOSR Journal of Dental and Medical Sciences 2013 (Jan.- Feb); 4(5): 64-69.
9. Ng A, Smith G. Intraperitoneal administration of analgesia: is this practice of any utility. Br J Anaesth 2002;89: 535-537.
10. Verma GR, Lyngdoh TS, Kaman L, Bala I. Placement of 0.5% bupivacaine soaked surgical in the gallbladder bed is effective for pain after laparoscopic cholecystectomy. Surg Endosc 2006;20:1560-4.
11. Rajesh Angral, Dr Seema Lachala, Dr Satyedev Gupta. Post-operative analgesic technique in laparoscopic cholecystectomy: Comparison of local instillation with bupivacaine vs intravenous butorphanol vs intercostal nerve block with bupivacaine. Sri Lankan Journal of Anaesthesiology 2013; 21(1) :9-13
12. Gvozdenovic1 L, Pajtic V, Ivanov D, Cvijanovic R, Gavrilovic1 S, Gojkovic Z, et al. Acute postoperative pain relief, by intraperitoneal application of local anesthetics, during laparoscopic cholecystectomy. J Health Sci 2011;1(2):90-5.