Effectivity of local bupivacaine infusion in the prevention of postoperative ileus

Erol Kiliç[1], Bülent Koca[2]
[1]General Surgery, Mustafa Kemal Universty, Hatay,
[2]Bafra State Hospital, Samsun, Turkey

Abstract

Aim: Inflammation is the predominant factor in the development of gastrointestinal dysmotility or postoperative ileus although dissection and neurological and inflammatory factors secondary to intestinal manipulation have been blamed. In this study, we investigated the effectivity of local bupivacaine infusion for prevention of postoperative ileus. Material and Method: This retrospective study included patients that underwent median laparotomy and received conventional analgesia alone or conventional analgesia followed by local bupivacaine. Patients that received conventional analgesia (nonsteroidal anti-inflammatory drugs [NSAIDs] + opioids) followed by local bupivacaine infusion (15 mg/h during 48h) with Pain buster pump system were classified as Group 1 (n=30) and the patients that received conventional analgesia alone ([NSAIDs] + opioids) were classified as Group 2 (n=31). Results: The groups were similar in terms of age, gender, preoperative ASA score, surgical technique, and operative time. The Visual Analog Scale (VAS) scores during the periods 8-24 and 24-48 h and the analgesic requirement during the periods 0-8, 8-24, and 24-48 h were significantly decreased in Group 1 compared to Group 2 ($p<0.05$). In Group 1, active postoperative bowel sounds started earlier (38 vs. 47 h) and mean time to first flatus/defecation was significantly lower than in Group 2 (64.13 ± 9.06 vs. 77.90 ± 10.25 h) ($p<0.05$). Discussion: Transfascial bupivacaine infusion appears to be an effective technique since it reduced early postoperative pain and postoperative analgesic requirement and also provided favorable effects in the prevention of postoperative ileus, thereby leading to shorter intensive care unit stay.

Keywords

Postoperative Ileus; Postoperative Analgesia; Transfascial Bupivacaine Infusion

DOI: 10.4328/JCAM.5980 Received: 09.08.2018 Accepted: 22.09.2018 Published Online: 25.09.2018 Printed: 01.01.2019 J Clin Anal Med 2019;10(1): 109-12
Corresponding Author: Erol Kiliç, Departman of General Surgery, Tayfur Sökmen Medicine Faculty, Mustafa Kemal Universty, 31000, Hatay, Turkey.
GSM: +905324067941 E-Mail: ekkilic55@gmail.com
ORCID ID: 0000-0002-0229-2911

Introduction

Postoperative pain often leads to nausea, vomiting, and ileus, thereby resulting in longer hospital stay and increased costs [1,2]. Postoperative analgesia induced by opioids, particularly by hydromorphone equivalents, results in postoperative ileus (POI) [3]. In the reduction of postoperative pain and complications, epidural or local anesthetic practices with transfascial catheters have recently emerged as popular techniques [2]. Postoperative paralytic ileus is a difficult complication which treatment remains controversial and inconclusive [4]. Patients with POI often face starvation, antibiotics, and decompression tubes and even undergo surgical treatment on the suspicion of bowel obstruction, which leads to increased hospital stay and treatment costs [5]. On the other hand, systemic local anesthetics lead to favorable outcomes including recovery of postoperative bowel function, lower pain scores, and shorter hospital stay as compared to conventional analgesics [6,7]. In this study, we aimed to investigate the effect of transfascial local bupivacaine infusion on POI in patients undergoing major abdominal surgery.

Material and Method

The retrospective study included patients that were followed up in intensive care unit (ICU) following median laparotomy and were administered either conventional analgesia alone or conventional analgesia followed by local bupivacaine in our clinic between 2016 and 2018. All the surgical procedures were performed under general anesthesia. Anesthetic induction was achieved with intravenous 2 mg/kg propofol, 0.6 mg/ kg rocuronium bromide, and 1 µg/kg fentanyl. Anesthetic maintenance was achieved with 6% desflurane. Patients with prolonged recovery were extubated in the ICU. Major abdominal surgery was defined based on the surgeries classified as Group A in the Turkish Republic Ministry of Health Practices Communiqué. A written informed consent was obtained from each participant and the study was approved by the local ethics committee.

Group 1 (n=30) included the patients that received conventional analgesia (nonsteroidal anti-inflammatory drugs [NSAIDs]) + opioids (diclofenac sodium 75 mg [Voltaren®] intramuscularly twice daily for 3 days + 10 mg/h of tramadol [Contramal(R)] intravenously for 2 days) followed by local bupivacaine infusion (15 mg/h during 48 h) (Marcaine(R) 20 ml, Astra Zeneca Ltd, Kırklareli, Turkey) via On-Q Painbuster(R) (MCM Group, Mexico) system and Group 2 (n=31) included the patients that received conventional analgesia alone (NSAIDs + opioids).

The ON-Q PainBuster® is an elastomeric pump that has a compatible single-line reservoir with a volume capacity of 270 ml, comprising a catheter with multiple small holes over the distal segment, and a preset flow rate of 5 mL/h. The most distal part of the catheter (approximately 3 cm) was placed in the abdomen and the remaining portion was placed on fascia of musculus rectus abdominis. The reservoir was filled with 140 ml of bupivacaine (Marcaine(R) 20 ml) and 130 ml of saline solution. The flow restrictor was fixed on the abdominal skin.

The local bupivacaine in Group 1, similar to the postoperative analgesic treatment in Group 2, was initiated in the first minutes after surgery. In both groups, additional 50 mg tramadol i.v. (Contramal(R)) was administered in the patients that had a Visual Analog Scale (VAS) score of ≥ 4 despite analgesic administration.

The two groups were compared in terms of patient age, gender, ASA score, surgical technique, operative time, postoperative VAS score, and analgesic requirement (VAS score ≥4). Moreover, the groups were also evaluated for POI based on active postoperative bowel sounds (detection of at least 4 bowel sounds per min in the right lower quadrant with the stethoscope), mean time to first flatus/defecation (hours), and length of ICU stay. POI was defined as a delay of 48 h or more in the activation of postoperative bowel sounds or a time to first flatus/defecation of longer than 72 h.

Patients that were receiving prokinetic drugs such as metoclopramide and neostigmine and those who had a history of abdominal surgery, remained intubated after surgery and underwent emergency laparotomy were excluded from the study.

Statistical Analysis

Data were evaluated using SPSS 21.0 for Windows (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.). For continuous variables, the normality test was performed using Kolmogorov-Smirnov and Shapiro-Wilk tests and parametric and nonparametric tests were used as required. Descriptive statistics were obtained for both groups and the results were compared using Student's t-test and Mann-Whitney U test. A p value of <0.05 was considered significant.

Results

Tables 1 and 2 present the characteristics and statistical variables for both groups. The groups were similar in terms of age, gender, preoperative ASA score, surgical technique, and operative time (Table 1). Surgical techniques included total gastrectomy, low anterior resection, the Whipple procedure, hepaticojejunostomy, and hepatectomy. The mean operative time was 176.16 min in Group 1 and 171.63 min in Group 2. An analysis of mean VAS scores and analgesic requirement during the periods 0-8, 8-24, and 24-48 h indicated that the VAS scores during the periods 8-24 and 24-48 h and the analgesic requirement during all the three periods were significantly decreased in Group 1 compared to Group 2 (p<0.05) (Table 2). Moreover, in Group 1, active postoperative bowel sounds started earlier (38 *vs.* 47 h) and mean time to first flatus/defecation was significantly lower compared to Group 2 (64.13 ± 9.06 *vs.* 77.90 ± 10.25 h) (p<0.05). Similarly, mean length of ICU stay was significantly lower in Group 1 compared to Group 2 (3.66 ± 1.02 *vs.* 5.73 ± 0.58 days) (p<0.05). Local erythema, hyperemia, ecchymosis and infection due to transfacial catheter application were not observed. No side effects of bupivacaine, diclofenac sodium and tramadol were observed.

Discussion

Postoperative ileus, defined as delayed defecation lasting 3-5 days accompanied by hypokinetic bowel sounds, is a frequent clinical condition occurring secondary to dissection during abdominal surgery. POI is mostly characterized by nausea, vomiting, pain, and abdominal distension, which lead to delayed healing [1,2]. Reduced gastrointestinal motility following intestinal

Table 1. Characteristics and statistical variables of both groups

		Group 1 Bupivacaine+(NSAIDs+opioids) Mean±SD	Group 2 NSAIDs+opioids Mean±SD
n		30	31
Age (years)		60.90±8.12	62.63±7
Gender (%)	Female	57	56
	Male	43	44
ASA Score (%)	II	62	64
	III	38	36
Surgical Technique			
Total gastrectomy		9	10
Low Anterior Resection		8	7
Whipple Procedure		5	6
Hepaticojejunostomy		4	3
Hepatectomy		4	5
Operative time (min)		176.16	171.63

NSAID: Non-Steroidal Anti-inflammatory Drug, SD: Standard Deviation, ASA: American Society of Anesthesiologists, min: minute.

Table 2. VAS scores, analgesic delivery, bowel motility and ICU stay in both groups

	Group 1 Bupivacaine+(NSAIDs+opioids) Mean±SD	Group 2 NSAIDs+opioids Mean±SD
VAS score (mean)		
0-8	5	6
8-24	3*	5
24-48	1*	2
Analgesic delivery		
0-8 h	8*	17
8-24 h	3*	11
24-48 h	1*	6
POI (%)	16.6*	29
Time to first postoperative bowel sound (h)	38*	47
Time to first flatus/ defecation (h)	64.13±9.06*	77.90±10.25
Length of ICU stay (days)	3.66±1.02*	5.73±0.58

NSAID: Non-Steroidal Anti-inflammatory Drug, SD: Standard Deviation, h: hour, VAS: Visual Analog Scale, POI ; Postoperative ileus, ICU: Intensive Care Unit,*p<0.05.

surgery is a common complication, leading to increased incidence of POI [8,9]. The incidence of POI after major abdominal surgery has been reported to be 3-32% [10], which has been shown to increase postoperative healing time, hospital stay, and treatment costs [11]. In our study, the patients with POI had longer ICU stays, which was consistent with the literature.

Numerous strategies have been described in the literature for the prevention of POI. Of note, epidural anesthesia is a common procedure that leads to shorter operative time, minimizes bowel trauma, and reduces postoperative opioid requirement. In our study, all the surgical procedures were performed under general anesthesia and both the operative times and surgical procedures in both groups were similar.

Opioids and local anesthetic drugs such as morphine are effectively and frequently used for controlling postoperative pain. However, morphine is known to cause postoperative gastrointestinal dysmotility [3]. Moreover, opioids lead to an increased resting tone in the anal sphincter and decreased anorectal sensitivity, thereby causing a reduction in propulsive colonic peristaltic contractions. In turn, ileus occurs as a result of an increase in nonpropulsive tonic contractions and in colonic muscle tone [12]. On the other hand, opioids have also been shown to cause a delay in the activation of bowel sounds and in the passage of flatus/defecation [12,13]. In our study, the VAS scores were lower, the opioid requirement was significantly lower, and both the bowel sounds and the passage of flatus/defecation started earlier in the bupivacaine group. We consider that these outcomes resulted from the reduced opioid requirement in this group. On the other hand, previous studies have also shown that gastrointestinal dysmotility leads to prolonged ICU stay [13]. In our study, the bupivacaine group had shorter ICU stays, which could be a result of the prevention of gastrointestinal dysmotility caused by opioids.

Conclusion

Transfascial bupivacaine infusion appears to be an effective technique since it reduces postoperative opioid requirement and also decreases the gastrointestinal dysmotility caused by opioids. This technique could be an alternative to conventional analgesic methods in patients undergoing major abdominal surgery.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: None

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

References

1. Johnson MD, Walsh RM. Current therapies to shorten postoperative ileus. Cleveland Clin J Med. 2009; 76: 641–8.
2. Ge B, Zhao H, Lin R, Wang J, Chen Q, Liu L, et al. Influence of gum-chewing on postoperative bowel activity after laparoscopic surgery for gastric cancer: A randomized controlled trial. Medicine (Baltimore). 2017; 96(13): doi: 10.1097/MD.0000000000006501.
3. Barletta JF, Asgeirsson, Senagore AJ. Influence of intravenous opioid dose on postoperative ileus. Ann Pharmacother. 2011;45: 916-23.
4. Augestad KM, Delaney CP. Postoperative ileus: impact of pharmacological treatment, laparoscopic surgery and enhanced recovery pathways. World J Gastroenterol. 2010; 16: 2067–74.
5. Iyer S, Saunders WB, Stemkowski S. Economic burden of postoperative ileus associated with colectomy in the United States. J Manag Care Pharm. 2009;15: 485–94.
6. Herroeder S, Pecher S, Schönherr ME, Kaulitz G, Hahnenkamp K, Friess H, et al. Systemic lidocaine shortens length of hospital stay after colorectal surgery: a double-blinded, randomized, placebo-controlled trial. Ann Surg.2007; 246: 192-200.
7. Harvey KP, Adair JD, Isho M, Robinson R. Can intravenous lidocaine decrease postsurgical ileus and shorten hospital stay in elective bowel surgery? A pilot

study and literature review. Am J Surg. 2009; 198: 231-6.
8. Fukuda H, Tsuchida D, Koda K, Miyazaki M, Pappas TN, Takahashi T. Impaired gastric motor activity after abdominal surgery in rats. Neurogastroenteral Motil. 2005; 17(2): 245–50.
9. Holte K, Kehlet H. Postoperative ileus: a preventable event. Br J Surg. 2000; 87(11): 1480–93.
10. Kronberg U, Kiran RP, Soliman MS, Hammel JP, Galway U, Coffey JC, et al. A characterization of factors determining postoperative ileus after laparoscopic colectomy enables the generation of a novel predictive score. Ann Surg. 2011; 253: 78-81.
11. Vather R, O'Grady G, Bissett IP, Dinning PG. Postoperative ileus: mechanisms and future directions for research. Clin Exp Pharmacol Physiol. 2014; 41: 358-70.
12. De Schepper, HU, Cremonini F, Park MI, Camilleri M. Opioids and the gut: pharmacology and current clinical experience. Neurogastroenterol Motil. 2004; 16: 383–94.
13. Gibson CM, Pass SE. Enteral naloxone for the treatment of opioid-induced constipation in the medical intensive care unit. J Crit Care. 2014; 29(5): 803-7.

How to cite this article:
Kiliç E, Koca B. Effectivity of local bupivacaine infusion in the prevention of post-operative ileus. J Clin Anal Med 2019;10(1): 109-12.