

Intravenous Infusion of Lidocaine During Anesthesia Decreases Duration of Post Appendectomy Ileus and Systemic Analgesic Consumption

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Abstract

Background and Aim: Animal and human studies showed that intravenous infusion of lidocaine may have beneficial effects on reducing pain and faster recovery of bowel movements during postoperative period. The present study aimed to investigate the effect of lidocaine infusion on ileus after appendectomy.

Methods: In this randomized double-blinded clinical trial, 40 patients undergoing appendectomy enrolled in the study. The regimen of anesthesia was similar in both groups. The lidocaine group received 1.5 mg/kg bolus dose injection of lidocaine immediately before induction of anesthesia and after endotracheal intubation infusion of lidocaine started with the rate of 3 mg/min (in patients weighing less than 70 kg, with 2 mg/min). Infusion of lidocaine was continued during surgery and 60 minutes after it. The control group received normal saline using the same method and dosage as a placebo. After the surgery, up to 3 days, a blind observer recorded the patient's systemic analgesic consumption and the time of first experienced passage of intestinal flatus.

Results: Average of age, duration of anesthesia and gender distribution in both groups showed no significant difference ($p > 0.05$). Average elapsed time from the end of operation to the first passage of flatus in the study group and the control group were 31.64 ± 5.49 and 41.31 ± 9.89 hrs, respectively ($p < 0.0001$). The mean postoperative analgesic consumption (pentazocine) on the first day after operation in study and control group were 18 ± 6.15 and 27.75 ± 5.49 mg, respectively ($p < 0.0001$). On the second day after surgery, 23 patients who had received analgesics, 5 individuals were in the study group and 18 individuals were in the control group ($p = 0.00007$).

Conclusions: The results of this study showed that lidocaine infusion during anesthesia and up to 1 hour after appendectomy reduces the duration of ileus and the need for systemic analgesic postoperatively.

Keywords: Intravenous lidocaine infusion, appendectomy, postoperative ileus, analgesic consumption

INTRODUCTION

Ileus is simply defined as an intestinal paralysis. Postoperative ileus is the most common cause of delayed discharge of patients from hospitals, following abdominal surgery. Ileus is transient and often reversible if the cause of it is amendable (1). Typically, within 24 hours after surgery, peristaltic movements of the small intestine and stomach recover but the colon paralysis particularly the sigmoid, may remain for more than 72 hours. The effect of epidural anesthesia on postoperative ileus has been proved many years ago (2, 3). Systemic absorption of lidocaine in epidural anesthesia may be responsible for its beneficial effects on postoperative course. It has been showed

that, intravenous lidocaine infusion may shorten period of hospital stay, decrease pain and accelerate return of bowel function in patients undergoing radical retropubic prostatectomy (4). The mechanism of action of lidocaine is probably due to the suppression of gastric inhibitory reflexes of peritoneal irritation after surgery (5).

Acute appendicitis has inflammatory properties and appendectomy is the most common emergency operation (6). According to our best knowledge, there is no report on the impact of intravenous lidocaine infusion on ileus after appendectomy. Therefore, in this study, we investigated the effect of intravenous lidocaine infusion on post appendectomy ileus.

METHODS

After approval of the ethics committee of medical sciences university and obtain patient's informed consent, 40 ASA physical status I/II aged 18-40 yrs enrolled in this randomized double-blinded clinical trial. Exclusion criteria were age <18 yrs or >40 yrs; ASA physical status >II; preoperative use of opioids, analgesics, or anticholinergics; patients with chronic gastrointestinal or hepatic diseases; and complicated appendectomy.

At the beginning of the study, patients were instructed to remember the exact time of the passage of the first flatus or first bowel movement. Patients were randomly allocated in two equal groups. All the patients received 5ml/kg Ringer's solution immediately before induction of anesthesia. The premedication was similar in all patients and included 1mg/kg intravenous midazolam and 1.5 mg/kg fentanyl at about 3-5 min before induction of anesthesia. General anesthesia was induced by intravenous thiopental sodium 5mg/kg and succinylcholine 1.5mg/kg. For maintenance of anesthesia N₂O (50%) and isoflurane was used and for maintenance of the muscular relaxation, atracurium besylate was used. Patients in the lidocaine group received a lidocaine bolus (1.5mg/kg) immediately before induction of anesthesia and after tracheal intubation, lidocaine infusion started at 3mg/min (for patients <70kg, with 2mg/min). Infusion of lidocaine continued during the operation and up to 60 min after the surgery. The control group received normal saline using the same method and volume. The surgeons, nurses and patients were all blinded about the type of the medication. During the hospitalization of the patients, a blind observer visited the patients and recorded the time of the first passage of the flatus and the consumption of systemic analgesics (pentazocine, commonly used in our surgical ward). Finally, the qualitative parameters, namely the time of passage of flatus and the dose of analgesic consumption, were analyzed using student's t-test or Mann-Whitney U test and qualitative parameters such as sex, analyzed by chi-square or Fisher's Exact tests. Differences were considered statistically significant when $p < 0.05$.

RESULTS

There was no significant difference of demographic data and the duration of anesthesia between two groups ($p > 0.05$) (see **Table 1**).

The average of time spent from the end of the operation to the first passage of the flatus in the study group was shorter than control group, 31.64±5.49 and 41.31±9.89 min, respectively. And this difference was statistically significant ($p = 0.0001$) (**Table 2**).

The average dose of the systemic analgesic consumption, pentazocine, in 24 hrs after surgery in the study group and control group was 18±6.15mg and 27.75±5.49mg, respectively. The difference in systemic analgesic consumption between two groups was statistically significant ($p < 0.0001$) (**Table 2**).

During the second postoperative day, 17 patients did not request any systemic analgesics. Fifteen of them (75%) were in the study group and two others (10%) were in the control group. Of 23 patients who received analgesics, 5 patients (25%) were in the study group and 18 (90%) patients were in the control group. According to Fisher's exact test there was a significance

Table 1. Demographic data and the duration of anesthesia in two group.

Variables	Study group (n=20)	Control group (n=20)	p value
Age (year) (mean±SD)	27.60±7	24.45±6.54	0.16
Gender (Male/Female)	16/4	14/6	0.71
Weight (kg) (mean±SD)	79.80±8.89	71.25±8.44	0.05
Duration of anesthesia (min) (mean±SD)	60±8.11	55±9.85	0.12

Table 2. Time to first gas passing and systemic analgesic consumption (during 1st postoperative day) in two groups

Variables	Study group (n=20)	Control group (n=20)	p value
Time spent to the first passage of flatus (hr) (mean±SD)	31.64±5.49	41.31±9.89	0.0005
Pentazocine dosage administered during 1 st postoperative day (mg) (mean±SD)	18±6.15	27.75±5.49	0.00001

Table 3. Distribution of absolute and relative frequency of systemic analgesic requesting during 2nd postoperative day between two groups

Variables	Control group (n=20)	Study group (n=20)
Patients that received analgesics	5 (25%)	18 (90%)
Patients that did not receive analgesics	15 (75%)	2 (10%)

difference between two groups ($p = 0.00007$). That means patients in the control group have requested more analgesics in the first 24 hours comparing to the study group (**Table 3**).

DISCUSSION

Our study revealed that infusion of intravenous lidocaine during appendectomy causes to accelerate the recovery of the intestinal function and to reduce systemic analgesic requirement for postoperative analgesia. Ileus often occurs after intra-abdominal surgery and this complication causes discomfort to the patient, prolonged hospital stay and other postoperative complications. It is interesting that in the United States, the cost of postoperative ileus has been estimated 1 billion annually (7). In recent decades the positive effect of epidural anesthesia on postoperative bowel function was proved (8) and several studies have been done in this regard (9-11). Recently, studies on the effect of intravenous infusion of lidocaine on bowel function and postoperative pain relief has been performed which had different results (5, 12-15). Intravenous lidocaine administration significantly attenuated the plasma levels of complement and inflammatory cytokines such as interleukin-8 and IL-6. IL-6 has a known role in maintaining postoperative ileus and intestinal wall permeability disorders. Surgery induces increased expression of L and P selectins which lidocaine takes role to

avoid it completely (16). Different studies have been done, comparing the effects of epidural anesthesia and infusion of systemic lidocaine on bowel function and postoperative pain and length of hospital stay but different results have been obtained (9, 17). The effect of lidocaine on bowel function in epidural anesthesia seems to be better than the systemic infusion (9), but in some of the patients, it is not possible to use the invasive epidural anesthesia for reasons such as patient refusal, or the use of anticoagulant medications. In these patients Intravenous administration of lidocaine would have better results.

In the study of Harvey *et al.* (18) the effect of intravenous lidocaine on the time of hospitalization in elective colorectal surgery is investigated on 22 patients. Since passage of intestinal flatus did not show significant differences in the lidocaine and the control group; the return time of bowel movements in the lidocaine group was more than 24 hours earlier than the control group and these patients were discharged earlier. We think that passage of the flatus is not apart from the recovery of the intestinal function. It is in fact, one way to monitor the function of the intestine. Therefore, the findings of our study are consistent with this report.

In our study, infusion of lidocaine hastened the passage of intestinal gas after appendectomy for about 10 hours. Herroeder and colleagues (16) found that lidocaine infusion during surgery and up to 4 hours after surgery may significantly accelerate return of bowel function so that bowel sounds and flatus occurred approximately 8 hours earlier. This finding is in line with the results of the present study. Additionally, Kaba *et al.* (19) showed that lidocaine infusion can hasten the return of bowel function. In their study, the time to pass flatus in lidocaine group was about 11 hours faster than the control group (17 vs. 28 hours). On the other hand, they found that the systemic analgesic consumption in the study group had significantly decreased. These findings are consistent with the results of our study.

Kim and coworkers showed that intravenous lidocaine is as effective as intraperitoneal instillation for reducing pain and fentanyl consumption after laparoscopic appendectomy (20). They speculated intravenous injection, as an easily and universally applicable procedure, which is a better alternative for pain reduction of patients who are undergoing laparoscopic surgery. Although in our study we did not aim to investigate pain after surgery, we found that infusion of lidocaine not only hastens the return of the intestinal function but also it can decrease analgesic consumption during post appendectomy period. Another finding was that there is a significant correlation between decreased opioid consumption at the first day after operation with decreased ileus duration.

This finding that lidocaine infusion reduces analgesic consumption (secondary to pain relief after surgery), have shown by several previous studies (4, 21, 22). It seems that the reduction of the opioid consumption may results in acceleration of the return of bowel function. However, the acceleration of bowel function recovery may be independent of decreased request for opioid analgesic. Both of these theories are possible. But the important point is that both outcomes, reduced need for opioid analgesics and reduction of postoperative duration of ileus are desirable. Our study demonstrated that infusion of lidocaine within and one hour after appendectomy will decrease the duration of ileus and the opioid analgesic consumption in the postoperative setting.

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