Journal of Clinical Anesthesia (2016) **28**, 95–104

ELSEVIER

Journal of Clinical Anesthesia

An estimation for an appropriate end time for an intraoperative intravenous lidocaine infusion in bowel surgery: a comparative meta-analysis

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Received 15 May 2014; revised 29 May 2015; accepted 13 July 2015

Keywords:
Perioperative;
Postoperative;
Pain;
Bowel surgery;
Infusion;
Fast-track

Abstract

Study objective: There exists no commonly accepted regimen for an intravenous lidocaine infusion (IVLI). This study aims to determine an appropriate end time for an IVLI during bowel surgery.

Design: A systematic search for randomized controlled trials assessing IVLI for bowel surgery was conducted using Ovid MEDLINE, EMBASE, CINAHL, Cochrane CENTRAL, Google Scholar, hand-searching references, and grey literature. Data were pooled for studies that stopped IVLI ≤60 minutes (intraoperative IVLI) after skin closure and where IVLI continued >60 minutes after surgery (postoperative continued IVLI). Quantitative analysis was done using the random-effects model.

Main results: Seven studies (n = 362) were identified after the systematic search. Three studies (n = 160) and 4 studies (n = 202) used an intraoperative and postoperative continued IVLI, respectively. An intraoperative IVLI significantly reduced pain scores at rest for 48 hours (standardized mean difference on a 0-10 scale, −1.24; 95% confidence interval, −1.93 to −0.56) and 72 hours (standardized mean difference, −1.12; 95% confidence interval, −1.79 to −0.44) compared with postoperative IVLI (test for interaction: $P < .001$ and $P = .003$, respectively). Although intraoperative IVLI reduced 24-hour pain scores on movement, this was not statistically different than pain scores in the postoperative IVLI group (test of interaction: $P = 0.68$). There were no differences between intraoperative IVLI and postoperative IVLI for postoperative in-hospital nausea, vomiting, time to bowel movement, and length of hospital stay.

Conclusion: Continuing an IVLI beyond 60 minutes after surgery has no added analgesic or gastrointestinal benefit. Further research is needed to clarify an optimal IVLI regimen and end time.

1. Introduction

Intravenous lidocaine infusions (IVLIs) have gained recent attention because of their beneficial effects in bowel

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http://dx.doi.org/10.1016/j.jclinane.2015.07.007
0952-8180/

surgical procedures. Systematic reviews and meta-analyses have demonstrated that IVLI can help reduce the development of postoperative ileus. Ileus has been cited as a factor in the development of respiratory infections, nutritional deficiencies, increased resource utilization, and delayed discharge from hospital [1–3]. These reviews demonstrate that IVLI can reduce postoperative pain, nausea and vomiting, and length of hospital stay [4–6]. Although epidural analgesia remains the criterion standard for postoperative pain after bowel surgery and also has a beneficial effect on postoperative ileus [7], epidurals may not be useful in certain patient populations (e.g., anticoagulated, systemic infection). Furthermore, meta-analyses have failed to demonstrate a reduction in length of hospital stay with epidural use [8].

Intravenous lidocaine infusions have been incorporated into fast-track surgery protocols where epidural placement is inappropriate or contraindicated. However, despite increasing attention, there seems to be no commonly accepted IVLI regimen. Trials using IVLIs differ in their bolus and infusion dosages along with different infusion start and end times. Intravenous lidocaine infusion end time is a critical aspect of the regimen because it has immense resource implications for postoperative monitoring and management. Many studies stop the IVLI immediately after surgery, whereas others continue postoperatively for varying periods of time. Continuing an IVLI beyond the recovery room and onto the surgical ward is impractical and suboptimal for many institutions because of the lack of monitored care available. The lack of an established IVLI end time promotes uncertainty when using an IVLI. Previous meta-analyses have demonstrated the beneficial effects of an IVLI, but none has provided insight into an appropriate IVLI end time.

The objective of this study was to determine an appropriate IVLI end time for patients undergoing bowel surgery. A systematic review of randomized controlled trials (RCTs) using IVLI for bowel surgery was conducted to compare studies using an early end time (≤ 60 minutes after skin closure) and those using a delayed end time (>60 minutes) on postoperative pain scores, nausea and vomiting, bowel movements, and length of hospital stay.

2. Methods

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (www.prisma-statement.org) guidelines throughout the design, implementation, analysis, and reporting of this study. No previous protocol has been published.

2.1. Eligibility criteria

We included published RCTs assessing the use of IVLIs during bowel surgery under general anesthesia that assessed pain as an outcome. Studies were excluded if they were animal studies, reviews/meta-analyses, case reports, or letters to editors; they used regional anesthesia; they did not use intravenous lidocaine infusion; spinal anesthesia was used; they used topical/local anesthesia; or they were irrelevant. Surgical procedures performed under combined general and neuraxial anesthesia were considered along with open and laparoscopic surgical procedures. We eliminated any duplicate publications found within and across databases.

The primary outcome of this study was pain scores at 24 hours after surgery. Secondary outcomes include pain scores up to 72 hours after surgery, postoperative nausea, vomiting, time to bowel movement, length of hospital stay, and adverse outcomes.

2.2. Search strategy

We searched the following databases for RCTs: Ovid MEDLINE, EMBASE, CINAHL, and the Cochrane Central Register of Controlled Trials. Informal searches were performed using Google Scholar and searching grey literature. References of previous reviews and relevant studies were hand-searched, and conferenced abstracts were screened to identify additional citations. Keywords that were used in the medical subject heading were as follow: *lidocaine*, *pain*, *surgery*, *perioperative*, and *intravenous*. No restrictions were placed for language or type of publication during initial search.

2.3. Selection of articles

Results from the systematic search were initially screened for duplicates. Citations were screened using a 2-stage screening and selection process. Standardized screening forms were created, piloted, and used for selection at both stages. The first stage consisted of title and abstract screening by 2 independent investigators. The same 2 investigators also reviewed the full text of included citations to determine eligibility into the review. Study authors were contacted if further clarification was needed. Consensus after full-text review was met through discussion by all study investigators.

2.4. Risk of bias assessment

The quality of selected articles was assessed using the Cochrane risk of bias tool [9]. This tool includes 7 domains (randomization sequence, allocation concealment, blinding of participants, blinding of outcome, incomplete outcome data, selective reporting, and other biases) and assessed whether studies are at high, low, or unclear risk of bias for each domain.

2.5. Data collection

Data were extracted by 2 independent investigators using standardized forms that were piloted using 2 included