Brief Report

Systemic Lidocaine Decreased the Perioperative Opioid Analgesic Requirements but Failed to Reduce Discharge Time After Ambulatory Surgery

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BACKGROUND: In this randomized, blinded, placebo-controlled trial, we evaluated whether systemic lidocaine would reduce pain and time to discharge in ambulatory surgery patients.
METHODS: Sixty-seven patients were enrolled to receive lidocaine or saline infusion perioperatively.
RESULTS: Length of postanesthesia care unit (PACU) stay did not differ between groups. Intraoperative opioid use was significantly less in the lidocaine group, both in the PACU and during the total study period but not after discharge. In the PACU, patients in the lidocaine group reported less pain (visual analog scale score 3.1 ± 2.04 vs 4.5 ± 2.9; $P = 0.043$). There were no differences in postoperative nausea and vomiting.
CONCLUSION: Perioperative systemic lidocaine significantly reduces opioid requirements in the ambulatory setting without affecting time to discharge.
(Anesth Analg 2009;109:1805–8)

Postoperative pain is the most common reason for delay in discharge and unplanned hospital admission after ambulatory surgery.[1–3]

Because postoperative pain is to a large extent an inflammatory phenomenon, administration of systemic local anesthetics, which have inflammatory modulatory properties,[4] could significantly reduce pain and therefore allow more rapid discharge.[5] Lidocaine has an excellent safety record when administered by low-dose infusion.[5–7] However, whereas decreased hospital stay after inpatient surgery has been demonstrated, the effect of intraoperative and early postoperative lidocaine infusion on duration of stay after ambulatory surgery is not known. Although it seems logical that decreased pain would allow earlier discharge, it is conceivable that, e.g., mild sedating effects of lidocaine could prolong postanesthesia care unit (PACU) admission and interfere with discharge.

We hypothesized that lidocaine, when administered systemically during the operative and early postoperative period, would decrease length of PACU stay (primary outcome measure). Secondary outcome measures were postoperative pain, opioid requirements, and postoperative nausea and vomiting.

METHODS

After IRB approval, informed consent was obtained from patients 18–75 yr of age (ASA physical status I–III) presenting for outpatient surgery under general anesthesia between August 2004 and August 2006.

Participants were assigned in a double-blind 1:1 ratio using a computer-generated randomization list to receive either a lidocaine or saline placebo infusion. At induction, all patients received 1.5 mg/kg of lidocaine by slow IV push. The lidocaine infusion (2 $mg \cdot kg^{-1} \cdot h^{-1}$ or equivalent volume of saline as placebo) was started immediately after induction of anesthesia and continued until 1 h after arrival in the PACU. Anesthetic management during surgery was standardized for opioid use (fentanyl as required and morphine up to 0.15 mg/kg), ketorolac (up to 30 mg

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Accepted for publication August 16, 2009.

Supported by departmental funding.

Marcel E. Durieux is the Section Editor of Anesthetic Pre-Clinical Pharmacology for the Journal. This manuscript was handled by Peter S.A. Glass, Section Editor of Ambulatory Anesthesiology, and Dr. Durieux was not involved in any way with the editorial process or decision.

Reprints will not be available from the author.

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DOI: 10.1213/ANE.0b013e3181be371b

Table 1. Opioid Equivalent Doses

Morphine	10 mg IV
Morphine	30 mg PO
Fentanyl	100 μg IV
Meperidine	75 mg IV
Oxycodone	20 mg PO
Percocet 5/325	6 tabs
Hydrocodone	30 mg PO
Vicodin 5/500	6 tabs
Vicodin 7.5/500	4 tabs
Tramadol	150 mg PO

IV after hemostasis was obtained if not contraindicated), and prophylaxis for postoperative nausea and/or vomiting (dexamethasone up to 0.1 mg/kg). In the PACU, pain was assessed at rest by a visual analog scale every 15 min and treated with either fentanyl (0.5–1 μg/kg) or morphine (0.01–0.02 mg/kg) when pain was more than 3 on a visual analog scale of 0–10 (0 = no pain, 10 = more pain imaginable). Nausea was assessed at 15-min intervals and treated with ondansetron or if persistent with promethazine or diphenhydramine. Discharge readiness was assessed by the PACU nurse using the modified Aldrete score every 15 min.[8] Patients were given a journal to record their analgesic use and level of pain and nausea the first 24 h after discharge. These data were obtained by a follow-up telephone call.

Twenty-five patients per group were needed to show a 30% reduction in our primary end point, time to the PACU discharge readiness (based on standard deviation of 50 min [estimated by chart audit]; $1 - \beta = 0.8$, $\alpha = 0.05$). This would translate to a reduction in discharge readiness from 120 min to 84 min, i.e., somewhat more than half an hour. Based on an expected withdrawal rate of 20%, 67 patients were enrolled in the trial. The primary end point was obtained by subtracting the time of arrival in the PACU from the time that patient discharge readiness was attained using the modified Aldrete score. PACU stay durations follow a 2-parameter lognormal distribution ($P > 0.7$).[9] We compared the groups by lognormal transformation followed by calculation of the 95% confidence interval using the referenced generalized pivotal approach.[10] Postoperative opioid requirements were calculated for each patient by converting opioids to morphine (mg) IV equivalents (Table 1), and the sample means from treatment and control groups were compared using a 2-tailed *t*-test for independent samples. The presence of nausea and vomiting in each group was analyzed using χ^2 test or Fisher's exact test. Data are presented as mean ± SD, unless stated otherwise.

RESULTS

Baseline demographic data as well as type and duration of surgical procedures were comparable between the 2 groups (Table 2). Patients in the lidocaine group received 517 ± 203 mg lidocaine during the infusion.

There was no difference in the primary outcome measure, length of PACU stay, between the groups (133 ± 58 min vs 135 ± 55 min; $P = 0.89$). The 95% confidence interval after lognormal transformation was −31 to 39 min.

Intraoperative opioid use (in morphine IV equivalent doses [MEQ]) was reduced by approximately 30% in the lidocaine group (20.52 ± 10.55 vs 30.15 ± 16.59; $P = 0.017$), approximately 50% in the PACU (MEQ: 8.72 ± 9.54 vs 15.93 ± 10.95; $P = 0.015$), and by approximately 40% during the total study period (operating room, PACU, and up to 24 h after discharge) (MEQ: 36.08 ± 17.13 vs 59.53 ± 18.59; $P = 0.002$). However, the use of analgesics during the first 24 h after hospital discharge was not significantly different between the groups (MEQ: 9.17 ± 9.14 vs 10.19 ± 10.45; $P = 0.76$) (Fig. 1). In the PACU, patients in the lidocaine group reported less pain at rest (VAS: 3.1 ± 2.04 vs 4.5 ± 2.9; $P = 0.043$) (Fig. 2). Twenty-four

Table 2. Patient Data

	Lidocaine ($n = 29$)	Saline ($n = 27$)	*P*
Sex, male versus female	24 vs 5	21 vs 6	0.9 (χ^2 test)
Age (yr)	43 ± 15	46 ± 15	0.45 (*t*-test)
Weight (kg)	81 ± 20	81 ± 21	0.99 (*t*-test)
Endotracheal intubation versus laryngeal mask (*n*)	23 vs 6	24 vs 3	0.472 (Fisher's exact test)
Anesthetic agent (*n*) (sevoflurane/desflurane/isoflurane)	20 vs 9 vs 0	18 vs 8 vs 1	0.579 (χ^2 test)
Anesthesia with versus without N_2O (*n*)	10 vs 19	4 vs 23	0.126 (χ^2 test)
Type of surgery			
Laparoscopic general (*n*)	11	13	
Open general (*n*)	3	3	
Endocrine and breast (*n*)	7	5	
Laparoscopic gynecology (*n*)	4	2	
Minor gynecology (*n*)	2	0	
Urology (*n*)	0	1	
Plastics (*n*)	2	1	
Minor ortho (*n*)	0	1	
Minor ear, nose, throat (*n*)	0	1	

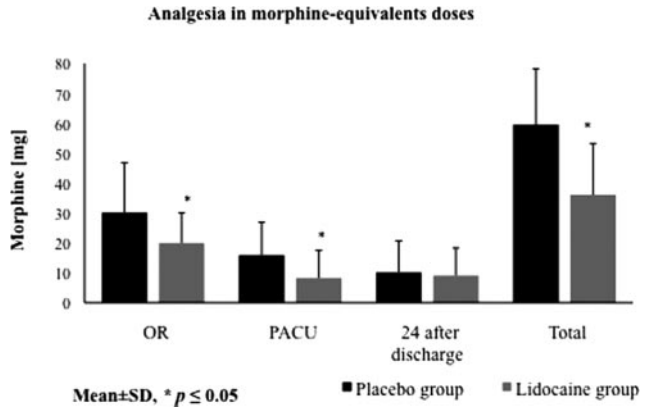

Figure 1. Opioid requirements in the lidocaine group versus the placebo group intraoperatively, in the postanesthesia care unit, for 24 h after discharge, and total opioid consumption. Results are presented as mean ± SD (*$P \leq 0.05$).

hours later, there were no differences in average pain scores (rest and activity) (VAS: 4.1 ± 1.8 vs 4.0 ± 2.4; $P = 0.97$).

No statistical differences were found for nausea (10 vs 13; $P = 0.825$) and vomiting (4 vs 5; $P = 0.733$).

There were no serious adverse events recorded. One patient reported dizziness and visual disturbance at the end of the infusion (lidocaine plasma level 2.4 μg/mL).

DISCUSSION

Several previous studies have examined the effect of IV lidocaine on recovery after surgery. Martin et al.[11] reported that a low-dose perioperative IV lidocaine after total hip surgery offers no beneficial effect on postoperative analgesia and does not modify pressure and tactile pain thresholds. In contrast, a meta-analysis of 8 randomized, controlled, clinical trials in patients undergoing abdominal surgery showed that continuous perioperative IV lidocaine administration reduces the duration of postoperative ileus, pain, nausea, and vomiting and shortens hospital stay.[12] However, none of these studies focused on surgery in the ambulatory setting.

To make the study clinically relevant, we accepted a relatively inhomogeneous study population, reduced standardization of anesthetic (without measurement of minimum alveolar concentration hours) and analgesic regimen, and lack of certain outcome data (recovery of gastrointestinal function and resumption of normal activities of daily living). Still, we found an opioid-sparing effect in the perioperative and early postoperative period. These effects did not affect recovery time by more than half an hour. The opioid-sparing effect of IV lidocaine did not affect the

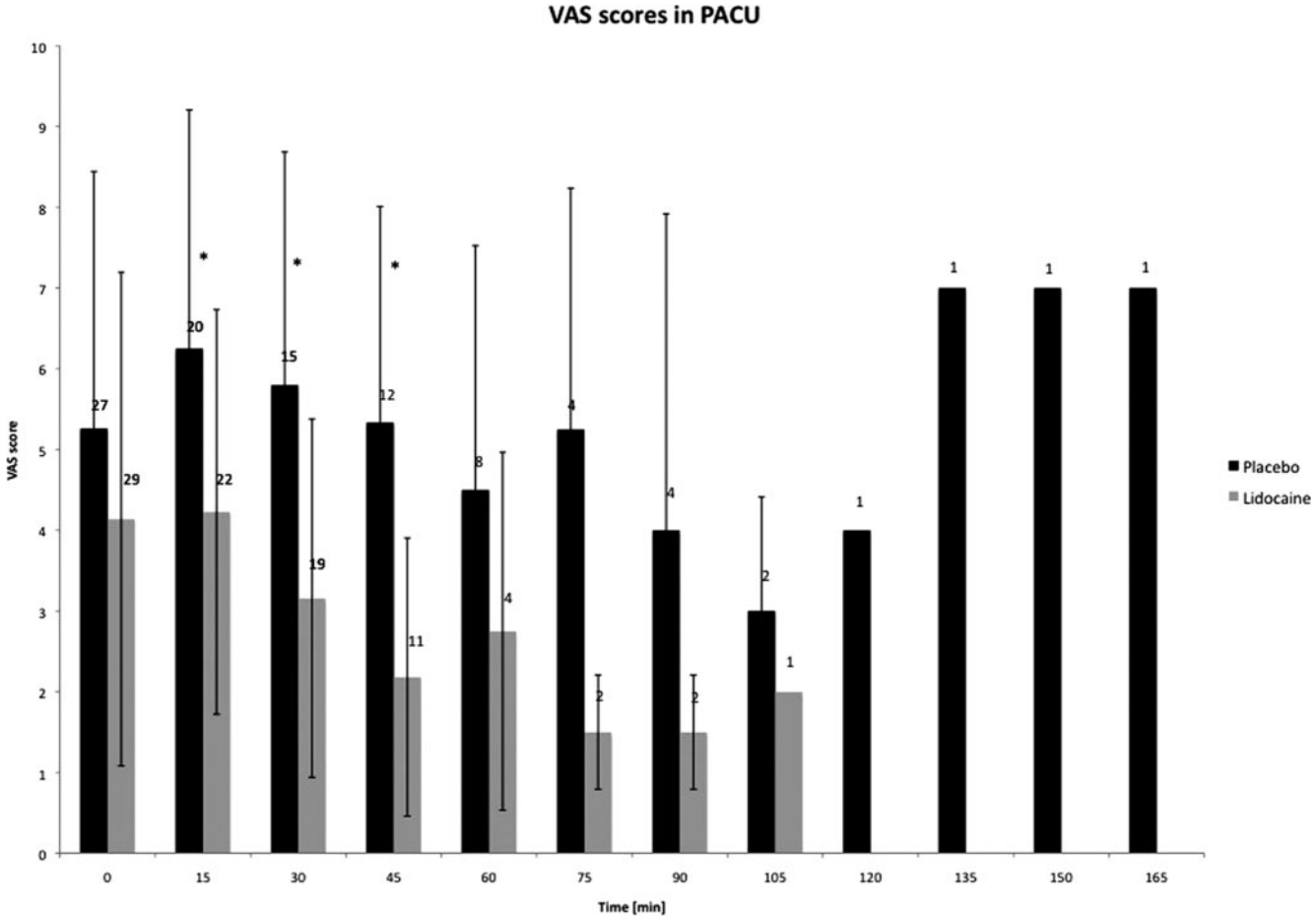

Figure 2. Visual analog scale scores in the postanesthesia care unit over time. Results are presented as mean ± SD (*$P \leq 0.05$ between the groups). Numbers above columns indicate group size.

incidence of nausea and vomiting in our study population. The nonhomogeneous study population and the administration of a lidocaine bolus before the administration of the study medication in both groups may have minimized possible differences between the 2 study groups. However, because it is safe, inexpensive, and does not require additional monitoring to that routinely provided in the PACU setting, lidocaine offers a potential therapeutic approach for perioperative analgesia in the outpatient setting.

ACKNOWLEDGMENTS

The authors thank Dr. Franklin Dexter for assistance in the statistical analysis of the data.

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