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PAIN

Systemic lidocaine fails to improve postoperative morphine consumption, postoperative recovery and quality of life in patients undergoing posterior spinal arthrodesis. A double-blind, randomized, placebo-controlled trial

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Abstract

Background. It is inconclusive whether the perioperative administration of systemic lidocaine provides effective postoperative analgesia and enhances recovery in major orthopaedic surgery. We hypothesised that in adolescent and adult patients undergoing posterior spinal arthrodesis, a perioperative lidocaine infusion would reduce opioid requirements during the first 24 postoperative h.

Methods. 70 patients undergoing posterior arthrodesis were enrolled in this prospective, randomised, double-blind, placebo-controlled clinical trial. Patients received total i.v. anaesthesia with propofol and remifentanil and were randomized to an adjuvant therapy with either lidocaine [i.v.-bolus injection of 1.5 mg kg^{-1} at induction of anaesthesia, followed by an infusion of 1.5 mg kg^{-1} h^{-1} which was continued until six h after arrival at the post-anaesthesia care unit] or placebo (equal volumes of saline). Postoperative pain was treated with patient-controlled i.v. morphine. Primary endpoints of this study were morphine requirements in the first postoperative 24 h.

Results. Systemic lidocaine did not decrease morphine requirements in the first 24 postoperative h [lidocaine-group: 48 (23) mg (mean(SD)) *vs* placebo-group: 51(19) mg, $P = 0.22$]. Likewise, groups were not different with respect to the severity of postoperative pain, morphine consumption after 48 and 72 h, incidence of postoperative nausea and vomiting, perioperative inflammation, time to recovery of intestinal function, hospital length of stay, and quality of life (assessed preoperatively and one month postoperatively using the SF-12 physical and mental composite scores).

Conclusions. In our study, systemic lidocaine had no analgesic benefits in posterior arthrodesis when added to an opioid-based anaesthetic regimen.

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Key words: lidocaine; pain; postoperative; spinal fusion

Editor's key points

- I.V. lidocaine has analgesic benefit in abdominal surgery; effects in spinal surgery are unclear.
- This study evaluated i.v. lidocaine effects on analgesia and adverse effects in spinal surgery.
- There was no reduction in opioid consumption or postoperative pain with systemic lidocaine.
- The type of surgery should be considered in tailoring multimodal analgesia.

Postoperative pain management after extensive spine surgery remains a challenging problem. The underlying mechanisms of postoperative pain in spine surgery are likely multifactorial and are the result of direct surgical trauma to osseous tissue at multiple levels, laminar decortication, and the corrective forces that are exerted on the spine after instrumentation.[1] Adequate postoperative pain relief is imperative to improve functional outcome, accelerate early ambulation and discharge from the hospital and to prevent the development of chronic pain.[2 3]

Opioids are still considered the corner stone for postoperative analgesia, but their use can cause clinically relevant adverse effects including respiratory depression, sedation, constipation, itching, ileus, urinary retention and postoperative nausea and vomiting.[4] These side-effects can increase perioperative morbidity and can delay hospital discharge. Therefore, modern analgesic strategies aim at reducing postoperative opioid consumption using a multimodal approach.[1 5 6]

Lidocaine is an amide local anaesthetic that has analgesic,[4] anti-hyperalgesic[7] and anti-inflammatory properties.[8] While in major abdominal surgery, the perioperative administration of i.v. lidocaine for postoperative pain relief has repeatedly been reported to provide effective postoperative analgesia, decrease opioid consumption, lessen the incidence of ileus and facilitate rehabilitation, the data on the efficacy of lidocaine in major orthopaedic surgery remain inconclusive.[5 9 10]

We hypothesised that in adolescent and adult patients undergoing posterior spinal arthrodesis, a perioperative lidocaine infusion would reduce opioid requirements during the first 24 postoperative h.

Methods

Study design and population

Seventy patients undergoing posterior spinal arthrodesis were enrolled in this prospective, double-blind, randomized, placebo-controlled clinical trial.

The study protocol was approved by the Ethics Committee of the University Hospitals of the KU Leuven, Belgium (EC OG032, May 6th, 2013, Chairperson Prof W. Van den Bogaert) and by the Belgian government. The study has been registered in the publicly accessible study register of the European Medicines Agency (EUDRACT 2012-005264-98). Patients were enrolled between September 2013 and July 2015. In our initial study protocol, inclusion criteria were an ASA physical status I–III and an age between 12 and 18 yr. Eight months after the beginning of the study, our Ethics Committee approved a modification of the inclusion criteria (EC OG032, December 23th, 2013) so that patients up to 75 yr could be included. This modification became necessary to increase the number of eligible patients. The exclusion criteria included hypersensitivity to lidocaine, liver disease (defined as total serum bilirubin ≥ 2 mg dl^{-1}), renal impairment (defined as Glomerular Filtration Rate ≤ 60 ml min^{-1} 1.73 m^{-2}), cardiac arrhythmias, epilepsy, intellectual disability and preoperative chronic medication with strong opioids (e.g. morphine or transdermal fentanyl).

After obtainment of written informed consent (either by the patients themselves or - in patients younger than 18 yr - by the parents), patients were randomized to either the lidocaine group (L-group) or the placebo group (P-group) using a computer-generated random table (Graphpad Software Inc., La Jolla, CA, USA) and an allocation ratio of 1:1.

Allocation concealment was achieved by enclosing assignments in sealed, opaque, sequentially numbered envelopes, which were opened only after arrival of the patient in the operation theatre. Blinding of research personal was maintained throughout the entire observation period including all postoperative follow-ups.

Study intervention

Patients in the lidocaine-group were given an i.v. bolus injection of lidocaine 1.5 mg kg^{-1} at induction of anaesthesia and then a continuous infusion of 1.5 mg kg^{-1} h^{-1} which was continued until six h after arrival at the PACU.[9 11–15] Patients in the placebo-group received equivalent volumes of saline using the identical application scheme. The study medication was prepared by an anaesthetist not being member of the study team and participating neither in the treatment or follow-up of the study patients. The study drugs were prepared in a 20-ml (for the bolus injection) and a 50-ml syringe (for the continuous infusion). The 20-ml syringe contained 1% lidocaine solution according to the weight of the patient (0.15ml kg^{-1}) or an equal amount of 0.9% saline. The 50-ml syringe contained either 500 mg lidocaine (10 mg ml^{-1}) or 0.9% normal saline solution.

Anaesthesia and perioperative treatment

All patients received a standardised anaesthesia technique including premedication with alprazolam (0.25 mg for patients with a body weight <50 kg, 0.5 mg for patients with a body weight >50 kg) one h before surgery. Induction of anaesthesia was performed with a target controlled infusion (TCI) with propofol applying the Marsh model[16] (Alaris® PK Syringe Pump, CareFusion, United Kingdom) with a targeted effective plasma concentration of 5 μg/ml, remifentanil (0.5 μg kg^{-1} min^{-1}) and cisatracurium (0.15 mg kg^{-1}). After tracheal intubation, anaesthesia was maintained with an i.v. infusion (TCI) of propofol and remifentanil. The doses of both agents were titrated at the discretion of the anaesthetist. Patients were extubated in the