



Opioid-free anesthesia using continuous dexmedetomidine and lidocaine infusions in spine surgery

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Opioids are the most commonly used analgesic perioperatively. However, there is wide inter-patient variability in the response to opioids and significant side effects are associated with their use.

We present the case of a 65-year-old man undergoing a two-level lumbosacral posterior spinal fusion under general anesthesia using dexmedetomidine, lidocaine, and nitrous oxide, without the use of any intraoperative opioids and minimal opioids postoperatively for 24 h. To our knowledge, this is the first report documenting this anesthetic technique and its benefits through the first postoperative day. This technique has significant potential advantages over more traditional methods of general anesthesia involving opioids.

A 65-year-old man with a history of hypertension, obesity, congenital bicuspid aortic valve status post-aortic valve replacement, pacemaker for postoperative bradycardia, and lumbar spinal stenosis presented for L4-S1 posterior lumbar fusion. His preoperative medications included aspirin 81 mg daily, metoprolol extended-release 50 mg daily, and lisinopril 5 mg daily. His surgical history included a previous L4-S1 laminectomy, appendectomy, arthroscopic knee surgery, and a bioprosthetic

aortic valve replacement.

General anesthesia was induced using dexmedetomidine (1 µg/kg over 10 min, started 10 min pre-induction), lidocaine (1.5 mg/kg), propofol (2 mg/kg), and succinylcholine (1 mg/kg). Following tracheal intubation, general anesthesia was maintained with intravenous infusions of dexmedetomidine (1 µg/kg/h), lidocaine (1.5 mg/kg/h), and inhaled nitrous oxide:oxygen (70 : 30).

Intraoperatively, the patient required a phenylephrine infusion for the majority of the procedure (range, 10–25 µg/min); this was discontinued 5 min before extubation. The patient's intraoperative heart rate did not vary significantly from his baseline heart rate. He was not pacemaker-dependent and the lower heart rate limit for active pacing was set at 50 beats/min. The dexmedetomidine infusion was discontinued approximately 30 min before the completion of surgery. The lidocaine infusion was discontinued immediately after extubation. The patient was extubated after a total operating time of 7.5 h without any complications. The patient did not receive any opioids intraoperatively. Within 3 min of extubation, the patient was awake and alert with an intact neurological exam. The patient denied experiencing pain in the operating room and on arrival at the post-anesthesia care unit (PACU). The patient used a total of 0.4 mg of hydromorphone during his 90-min PACU stay via patient-controlled analgesia. He was transitioned to oral morphine within 3 h of being discharged from the PACU and his total 24-h postoperative oral (PO) morphine milligram equivalent (MME) usage was 70 mg (IV MME 23.3 mg). His maximum pain score on a numeric rating scale (NRS) was 3/10. He denied nausea, vomiting, sedation, or constipation. Furthermore, he did not show any signs of respiratory depression (oxygen saturation, 97–100% on room air) postoperatively.

The most common causes of delayed discharge from the

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Table 1. Total 24-h Postoperative Opioid Use (IV MME)

Kim (2017)*	23 mg
Hernández-Palazón (2001) [†] [2]	42 mg
Cohen (1997) [†] [1]	93 mg
Reuben (1997) [†] [3]	106 mg

Total 24-h postoperative opioid use (IV MME; intravenous morphine milligram equivalent) in patients after undergoing spinal fusion surgery with continuous intraoperative dexmedetomidine and lidocaine infusion (*) compared with traditional intraoperative general anesthetic without dexmedetomidine and lidocaine infusion (†).

PACU are postoperative pain and postoperative nausea and vomiting (PONV). Limiting opioids and their potential side effects in the perioperative period, while still maintaining adequate analgesia, may facilitate PACU discharge and patient recovery. Our patient used significantly less MME postoperatively (70 mg PO or 23.3 mg IV in 24 h) compared with similar reports of patients undergoing posterior spinal fusion using a traditional, opioid-based intraoperative anesthetic without dexmedetomidine or lidocaine (Table 1) [1–3]. He did not require IV rescue boluses of opioids and denied PONV while remaining hemodynamically stable postoperatively. An added benefit of the opioid-free intraoperative course was the potentially safer and relatively fast emergence from anesthesia that facilitated a prompt neurological examination.

Lidocaine has been used as an intravenous adjunct to control intraoperative pain and decrease postoperative pain scores. Lidocaine's analgesic effect can extend for months following surgery, possibly due to sustained concentrations of lidocaine in the cerebrospinal fluid [4]. The exact mechanism of lidocaine's benefits remains unclear. Traditionally, the mechanism of local anesthetics has been attributed to their membrane-stabilizing effect via the inhibition of voltage-gated sodium channels. More recent studies suggest a reduction in central sensitivity

and hyperalgesic pathways, inhibition of N-methyl-D-aspartate (NMDA) receptors, and a decrease in inflammatory biomarkers as contributing mechanisms.

Dexmedetomidine is a highly selective α_2 agonist that has anxiolytic, sympatholytic, and analgesic properties. Like lidocaine, dexmedetomidine has been shown to lower postoperative pain scores, opioid consumption, and the risk of opioid-related adverse events. However, there are few reports on the systemic use of lidocaine and dexmedetomidine infusions simultaneously for perioperative analgesia. Bakan et al. [5] reported the use of intravenous dexmedetomidine and lidocaine intraoperatively resulting in decreased postoperative opioid use in laparoscopic cholecystectomy at the second postoperative hour. However, they failed to show a difference by the sixth postoperative hour compared with an opioid-based anesthetic. Possible side effects of dexmedetomidine include bradycardia, hypotension, and postoperative sedation. None of these were encountered in our patient.

To our knowledge, this is the first report describing the combined use of dexmedetomidine and lidocaine infusions in spinal fusion surgery. This anesthetic limited the intraoperative opioid requirement and may have resulted in improved analgesia for a minimum of 24 h postoperatively. Avoiding opioids can also prevent associated adverse effects, including nausea, constipation, pruritus, sedation, hormonal and immunologic dysfunction, respiratory depression, and death. Given the high incidence of chronic pain and increased opioid use after spinal fusion surgery, perioperative analgesic methods that reduce pain and the need for opioids may be especially beneficial for patients undergoing this procedure. This technique also avoids the risk of hyperalgesia associated with the intraoperative use of opioids, especially remifentanyl. This novel technique is a potential alternative to traditional methods of general anesthesia that involve opioids.

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