



Non-Opioid Anesthesia with a Ketamine-Lidocaine-Dexmedetomidine-Magnesium Infusion for Lumbar Interbody Fusion in a 46-Year-Old Obese Female

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INTRODUCTION

Opioids are the most commonly used analgesic in perioperative period. However, there is variable response and significant adverse effects associated with their use.

Unprecedented opioid crisis is significantly affecting the U.S and Canada. Most patients on long-term opioid therapy become dependent or addicted which may result in withdrawal symptoms on abrupt discontinuation.

In the U.S, three quarters of heroin users were initially exposed to prescription opioids. More than 105,000 adults died from drug overdose in 2023 (National Institute on Drug Abuse, 2024).

Due to the current opioid crisis in the U.S, the Enhanced Recovery After Surgery (ERAS) Society recommend minimizing the use of opioids in obese patients to reduce postoperative adverse effects. One of the strategies is to use opioid-free anesthesia (OFA), which combine multiple medications with different mechanisms.

CASE PRESENTATION

46-year-old female, BMI 41.2, presented for posterior lumbar fusion. Chronic back pain, bilateral leg pain with tingling/numbness, worse with exertion, relieved by rest.

Medical History: Hypertension, obesity, hyperlipidemia, osteoarthritis, depression, L4-L5 spondylolisthesis.

Surgical History: Laparoscopic sleeve gastrectomy (6 years prior), esophagogastroduodenoscopy biopsy (3 years prior), cholecystectomy, cesarean delivery.

Preoperative Medications: Aspirin 81 mg daily, losartan-hydrochlorothiazide 100/12.5 mg daily, tramadol 50 mg every 8 hours PRN.

MRI Findings: Multilevel spondylosis, mild progression at L4-L5 and L5-S1, moderate central canal stenosis at L4-L5, mild-to-moderate bilateral foraminal stenosis.

Intraoperative Infusion (single syringe, 50 mL total, 0.25 mL/kg/hour): Lidocaine 2% (500 mg), ketamine (500 mg), dexmedetomidine (50 µg), magnesium sulfate (5 g), normal saline (9.5 mL); single-syringe delivery facilitates dose adjustment and enhances administration convenience.

Postoperative Pain Management (first 48 hours): Fentanyl 50 mcg (IV bolus), hydromorphone 2 mg (IV drip), oxycodone 25 mg total (PO), ketorolac 30 mg (IV bolus).

IMAGING

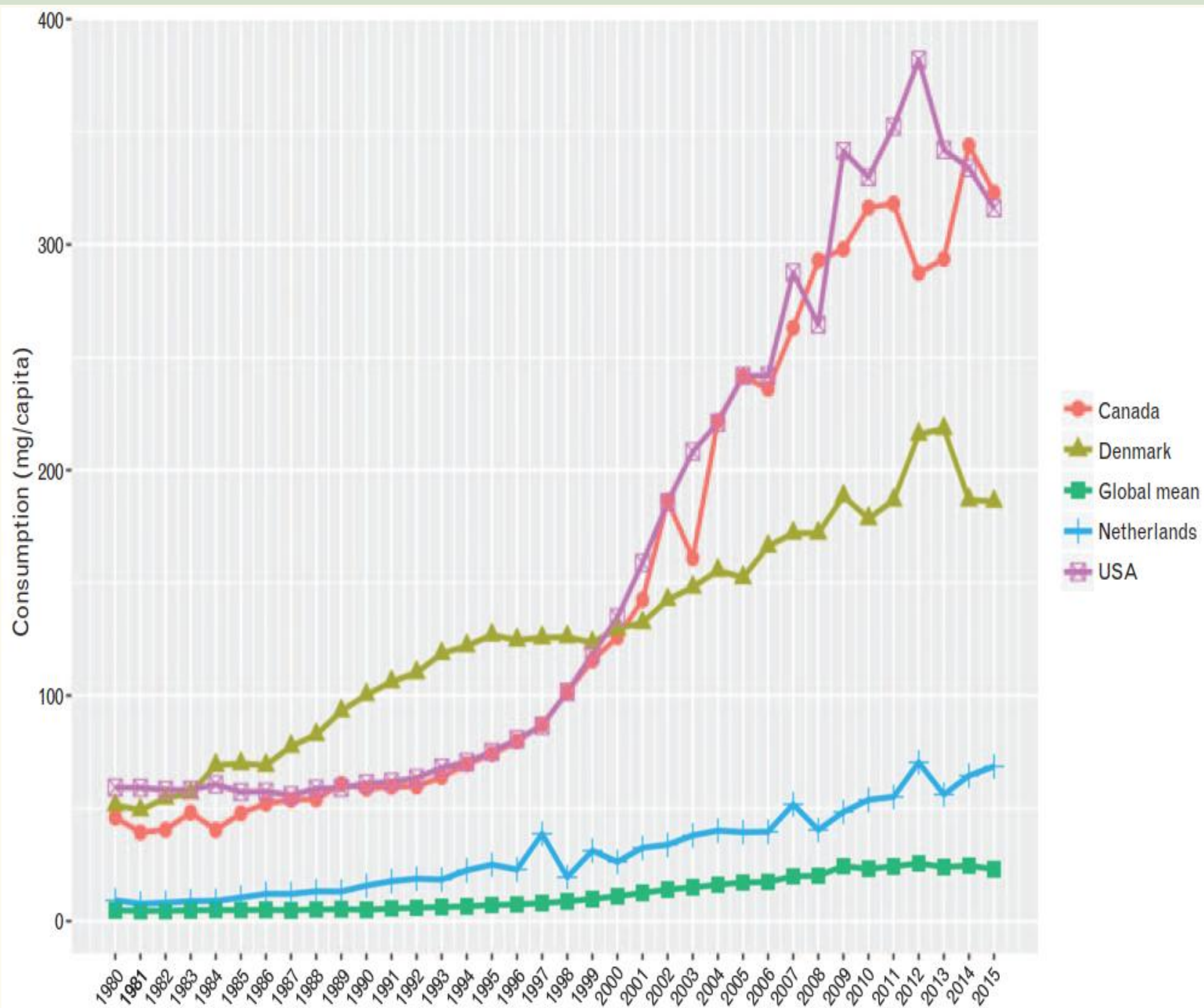


Figure 1. Total opioid consumption for selected countries (mg/capita) from 1980 to 2015. Sources: International Narcotics Control Board; World Health Organization population data. By: Pain & Policy Studies Group, University of Wisconsin / WHO Collaborating Center, 2018.

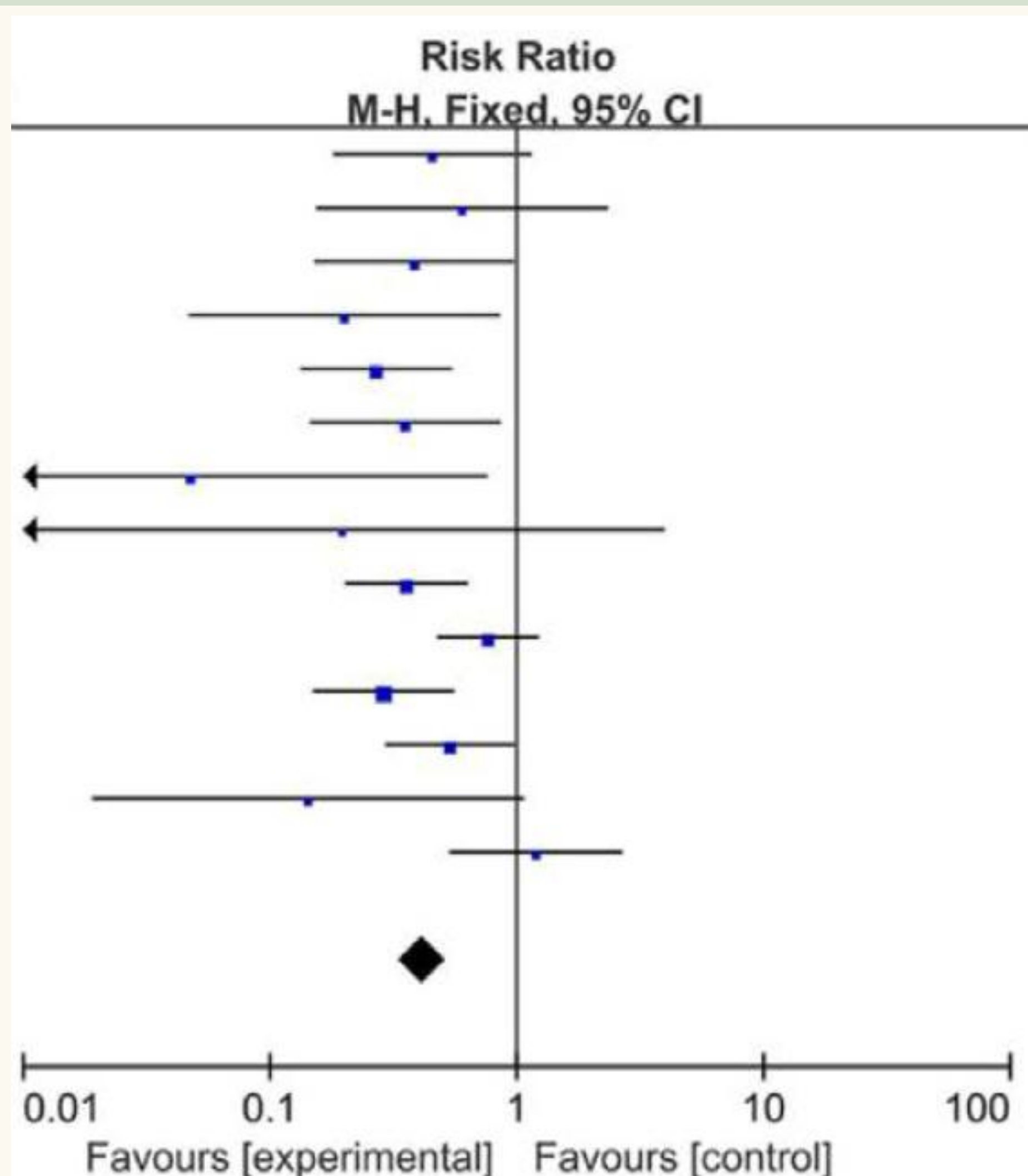


Figure 2. Risk of PONV in OFA group versus control group (OA). OFA, opioid free anesthesia; OA, opioid anesthesia; PONV, postoperative nausea and vomiting. Source: Zhang et al. (2023)

DISCUSSION

- Opioid-free anesthesia (OFA) supports faster recovery, reduces opioid-related toxicities, and lowers addiction risk. For our patient, a single 50 mL syringe containing lidocaine, ketamine, dexmedetomidine, and magnesium sulfate was compounded by pharmacy (Class V preparation, 4-day room temperature storage). This single-syringe approach simplified dose adjustments, improved administration convenience, and reduced costs by utilizing large-dose vials for multiple surgeries.
- The infusion components contributed distinct benefits:
- Dexmedetomidine:** A selective α_2 agonist, it provides sedation and analgesia by modulating sympathetic activity, reducing postoperative pain, opioid use, and related adverse events, though it may cause hypotension, bradycardia, or sedation.
- Ketamine:** An NMDA receptor antagonist, it prevents hyperalgesia and reduces pain scores and opioid consumption when added to IV patient-controlled analgesia with morphine.
- Lidocaine controlled intraoperative pain and may provide prolonged postoperative analgesia, potentially due to sustained cerebrospinal fluid levels. Magnesium sulfate enhanced ketamine's effects, reducing its required dose and side effects. A study of 90 patients undergoing breast cancer surgery showed that combining ketamine with magnesium lowered intraoperative fentanyl and postoperative opioid use.
- Recent spine surgery trials reinforce these findings. A 2024 study using dexmedetomidine and lidocaine in multilevel fusions reported reduced 24-hour morphine use (17.28 vs. 27.96 mg, $p < 0.05$) and less postoperative nausea, despite longer PACU stays (114.1 vs. 89.96 min, $p < 0.05$) (Barakat et al., 2024). Another 2024 study with ketamine-ketofol OFA noted extended pain-free periods (9.86 vs. 6.93 hours, $p = 0.002$) and reduced postoperative fentanyl (Rani et al., 2024).
- Our patient tolerated the infusion well intra- and postoperatively, with no adverse effects, minimal opioid use, and reported comfort. While dexmedetomidine, ketamine, lidocaine, and magnesium are well-studied in ERAS protocols for spine surgery, their combined use requires further research.
- The quadruple mixture (lidocaine, ketamine, dexmedetomidine, and magnesium sulfate) remains stable for at least 8 weeks and can be stored for up to 148 days. This supports the safety and reliability of preparing the mixture in a single syringe, enabling the hospital pharmacy department to compound it in advance for elective surgeries.

CONCLUSION

- OFA for lumbar spinal decompression can help mitigate perioperative opioid exposure without affecting pain control intraoperatively.
- Further studies are necessary to evaluate long-term consequences of OFA, such as opioid use and the risk of chronic pain.

REFERENCES

- Please scan the **QR code** for relevant references.

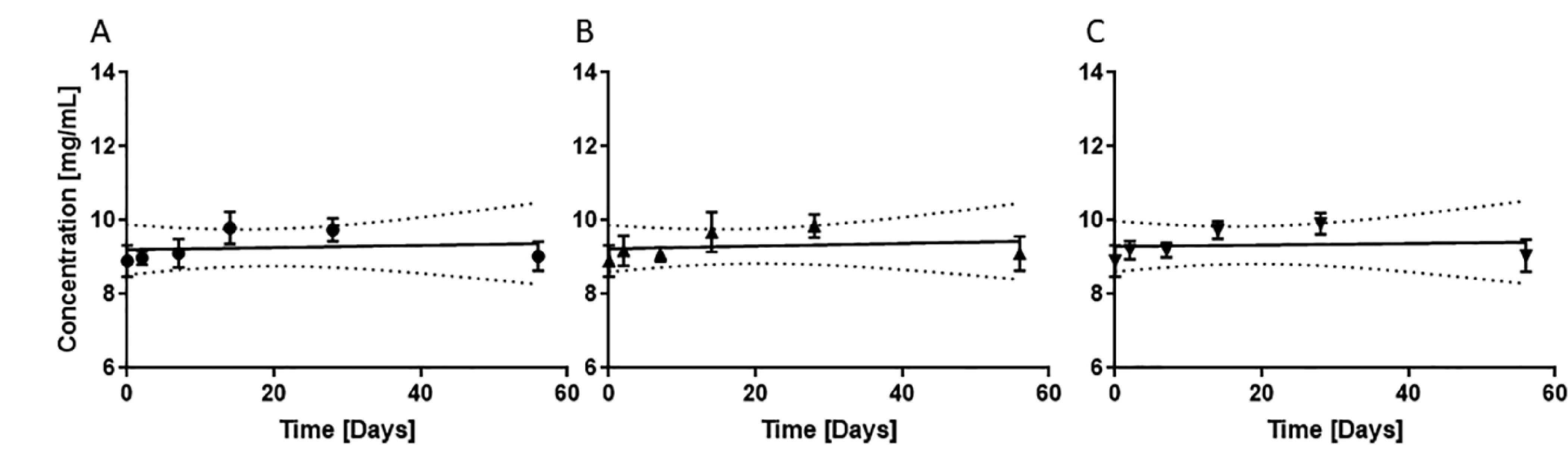


Figure 3. Stability of lidocaine in 0.9% saline in combination with Mg at different storage conditions: (A) room temperature, (B) room temperature and light protection, and (C) refrigerator (2-8°C). Dotted lines represent 95% CI bands. Source: Schenkel et al. (2022).