AN OPTIMAL INTRAOPERATIVE KETAMINE DOSAGE FOR POSTOPERATIVE PAIN MANAGEMENT

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Abstract

Purpose: Postoperative pain is defined as a form of acute pain that arises after surgical manipulation and trauma accompanied by an inflammatory reaction and commencement of an afferent neuronal cascade. Clinicians have multiple methodologies regarding management of postoperative pain. An extensive search of the literature was conducted to evaluate if there is an optimal intraoperative intravenous ketamine dose to effectively manage postoperative pain.

Introduction

Postoperative pain

- 80% of patients experience postoperative pain today
- Leads to delayed healing, discomfort, morbidity, and increased hospital costs
- Risk factors: history of anxiety, drug or alcohol abuse, opioid use, smoking status, use of antirheumatic drugs
- Different methods of anesthesia administered and drugs given perioperatively can either potentiate or alleviate postoperative pain

Anesthesia and pharmacologic agents

- Use of multiple drugs
- Must know therapeutic effects, adverse effects, and pharmacodynamic and pharmacokinetic properties of each drug
- Multiple methodologies regarding postoperative pain management
- Common opioids used: fentanyl, hydromorphone, morphine, and meperidine
- Ketamine's role in pain management deserves more research and recognition

Ketamine

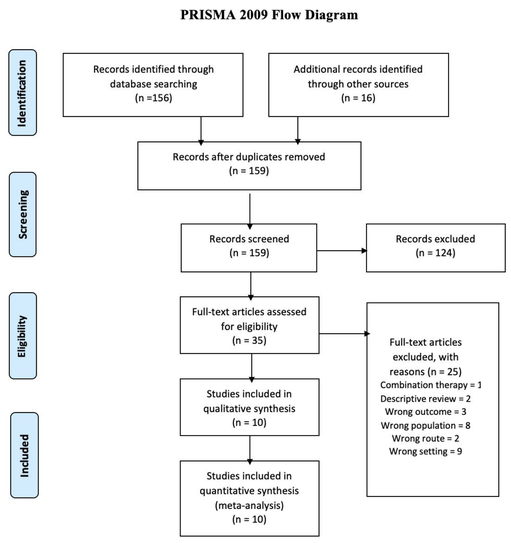
- Phencyclidine derivative developed in 1960s
- *N*-methyl-d-aspartate (NMDA) receptor noncompetitive antagonist
  - Important in augmenting pain signaling, opioid tolerance, and sensitization of CNS
- Analgesic effects at subanesthetic doses
- Activates dopamine 2 (D2), monoaminergic, and opioid receptors at higher doses
  - Side effects: hallucinations, dissociation, confusion, slowed breathing, immobility, and seizures
- Has been shown to reduce or reverse opioid tolerance and opioid-induced-hyperalgesia
- Further investigation required to determine an optimal ketamine dose to be administered intraoperatively to provide postoperative analgesia

Materials & Methods

Participants

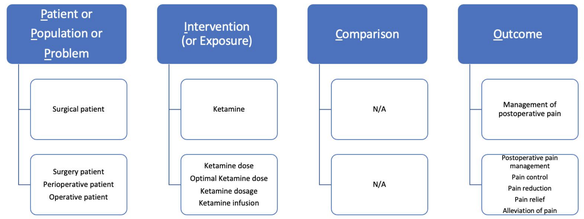
- Adults aged 18 years and older
- ASA I or II
- No exclusions made based on the type of surgery being studied

Methods



PICO Search Strategy Chart

In the adult surgical patient, is there an optimal intraoperative intravenous ketamine dosage to effectively manage postoperative pain?



Results

Studies: 9 randomized, placebo-controlled, blinded studies and 1 case study

Themes

Bolus and Infusion

- Brinck et al.: *S*-ketamine bolus of 0.5 mg/kg and infusions at 0.12 mg/kg/hr and 0.6 mg/kg/hr are not optimal doses to effectively manage postoperative pain after multi-level lumbar fusion surgery
- Choi et al.: Ketamine given as a 0.3 mg/kg bolus followed by a 0.18 mg/kg/hr infusion provided postoperative analgesia after laparoscopic cholecystectomy surgery
- Kang et al.: Ketamine given as a 0.5 mg/kg bolus and an infusion of 0.12 mg/kg ran at 0.06 ml/kg/hr effectively managed postoperative pain after unilateral breast cancer surgery
- Kim et al.: A 0.5 mg/kg bolus dose of ketamine followed by a 2 mcg/kg/min infusion significantly reduced postoperative fentanyl consumption after lumbar spinal fusion surgery

Infusion Without Bolus

- Nikoubakht et al.: Ketamine given at a rate of 0.1 mg/kg/hr effectively managed acute postoperative pain after PSF surgery
- Barelli et al.: Ketamine administered at 0.2 mcg/kg/min achieved successful postoperative pain management in a opioid-addicted patient chronically managed on methadone

Single Bolus

- Pajina et al.: While the ilioinguinal-iliohypogastric nerve block was superior to ketamine and placebo in achieving postoperative pain control, 0.25 mg/kg of single dose ketamine still provided pain relief
- Jaafapour et al.: 0.25 mg/kg and 25 mg of ketamine provided postoperative analgesia after cesarean delivery under spinal anesthesia
- Moro et al.: 0.2 mg/kg nor 0.4 mg/kg were superior to placebo in relieving postoperative pain or reducing morphine consumption following laparoscopic cholecystectomy
- Heydari et al.: 0.25 mg/kg of ketamine provided postoperative pain relief after lower extremity orthopedic surgery

Conclusion

- An optimal intraoperative ketamine dose to manage postoperative pain is still to be determined
- A single bolus dose of 0.2-0.5 mg/kg or an infusion at 0.1 mg/kg/hr can effectively manage postoperative pain
- While more research is needed regarding this area of interest, the available literature supports utilizing low-dose ketamine intraoperatively to provide postoperative analgesia

Limitations

- Small sample sizes across articles
- Subjective means of measuring postoperative pain
- Non-standardized anesthetic methods (TIVA, neuraxial, and GA all utilized)
- Variety of surgical procedures
- Intermittent opioid boluses in some studies

References

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