

Dexmedetomidine as an Adjuvant Analgesic to Improve Patient Outcomes

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Structured Abstract

Background

Poorly managed pain control in the perioperative period can result in decreased patient satisfaction, delayed recovery, prolonged hospitalization, and further complications. Acute postoperative pain can progress to chronic pain syndromes, which can affect the patient's quality of life. The mainstay of perioperative pain management has largely been opioid based. Opioid-related side effects include ventilatory depression, excessive sedation, postoperative nausea and vomiting (PONV), constipation, and itching. Researchers have recently identified the direct correlation between the perioperative administration of opioids and occurrence of adverse events. Hence, emerging trends are shifting towards minimizing and alleviating the use of opioids. The ideal perioperative pain management plan aims to prevent and relieve pain while limiting side effects.

A 17-year-old, 58 kg female with a deviated nasal septum, and dentofacial anomaly presented for a LeFort I bilateral sagittal split osteotomy, genioplasty, and rhinoplasty. During induction, fentanyl 100 mcg, lidocaine 40 mg, propofol 160 mg, ketamine 25 mg, and rocuronium 40 mg IV were administered. After nasal intubation, anesthesia was maintained with an end-tidal concentration of desflurane at 5.2%, propofol 25 mcg/kg/min IV infusion, and dexmedetomidine 0.7 mcg/kg/hour IV infusion. The dexmedetomidine infusion was titrated to maintain induced hypotension per surgeon request. During incision closure, ketorolac 30 mg and ondansetron 4 mg IV were administered. The dexmedetomidine infusion was continued during extubation in a deep plane of anesthesia. The patient was hemodynamically stable and denied nausea or pain one hour following arrival to the post-anesthesia care unit (PACU).

Clinical Question

Does dexmedetomidine in conjunction with other analgesic agents improve perioperative analgesia and reduce opioid requirements in patients undergoing painful surgery requiring airway protection at extubation?

Evidence Based Discussion

Multimodal analgesia involves the integration of opioid and non-opioid pharmacologic mechanisms of pain relief acting on different sites via various routes of administration. The resulting additive and synergistic effects can reduce the dose of each drug, and thereby their side effects. The use of epidurals, regional nerve blocks, and local infiltration at surgical sites, as well as administration of nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, gabapentin, lidocaine, opioids, ketamine, and alpha-2

adrenergic receptor agonists are all methods that may be utilized and tailored for each individual patient.

The analgesic effects of dexmedetomidine are produced by a multifaceted mechanism in all perioperative phases. It has proven to be a useful adjuvant analgesic due to its mechanism of action independent of opioid receptors. The opioid-sparing effect of dexmedetomidine has been attributed to its analgesic, anxiolytic, and hemodynamic effects. Several theories exist regarding the exact mechanism of analgesic action, of which most are centered around its potent agonistic action at central and spinal cord alpha-2 receptors producing antinociceptive effects. Better pain management, reduced opioid requirements, and improved patient satisfaction have all resulted from a bolus or infusion of dexmedetomidine.

Evidence supports the use of intraoperative dexmedetomidine infusion as an adjuvant analgesic to improve pain outcomes in the acute and chronic postoperative period, as well as improved quality of life. Orthognathic surgeries are painful procedures that require airway protection at extubation. A dexmedetomidine infusion was incorporated into the multimodal analgesia plan for the 17-year-old patient for its opioid-sparing analgesic, anxiolytic, and hemodynamic effects. One of the main priorities in this procedure was to provide adequate analgesia without sacrificing the patient's ability to adequately ventilate postoperative after extubation. Avoidance of side effects of opioids, including PONV and respiratory depression, was of importance due to the interdental wiring and limited access to the patient's airway. An intraoperative dexmedetomidine IV infusion of 0.2 to 0.7 mcg/kg/h can be used as an adjuvant analgesic safely and effectively in painful procedures that require airway protection at extubation.

Translation to Practice

Research translation to practice can be accomplished by initiating interprofessional collaboration between anesthesia practitioners, surgeons, pharmacists, and PACU nurses. A protocol outlining the most appropriate candidates to receive dexmedetomidine, as well as the timing and dosage ranges, will be developed. Educational sessions will be conducted sharing the benefits of dexmedetomidine use and explaining the implementation of the protocol into practice. Due to the morbidity and mortality related to the widespread opioid epidemic, evidence that demonstrates improved surgical pain outcomes with reduction in opioid use might increase engagement of stakeholders. Further research is needed regarding most effective dosage ranges, timing of administration, and use of boluses versus infusions. Additional research to promote greater involvement of stakeholders can bridge the gap between available evidence and translation to practice.

Keywords: dexmedetomidine, multimodal analgesia, perioperative pain, opioid sparing

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