OPEN ACCESS Freely available online

Journal of Anesthesia & Clinical Research

Commentary

Adjuncts to Caudal Anesthesia for Prolonging Analgesic Duration

Samuel Thompson*

Department of Anesthesiology, Midwestern Institute of Medical Sciences, Lakeport, USA

DESCRIPTION

Caudal anesthesia has long been a cornerstone of pediatric and lower abdominal surgical analgesia due to its simplicity, reliability and favorable safety profile. Its utility extends beyond surgery, providing postoperative analgesia that can significantly improve patient comfort and reduce systemic opioid consumption. Despite its advantages, a major limitation of caudal anesthesia remains its relatively short duration of action when local anesthetics are administered alone. Consequently, clinicians and researchers have explored various pharmacological adjuncts to extend analgesic duration while maintaining a favorable safety profile, aiming to enhance patient outcomes and reduce the need for supplemental analgesics.

The concept of adjuncts in caudal anesthesia revolves around combining a primary local anesthetic, typically bupivacaine, ropivacaine, or levobupivacaine, with secondary agents that either potentiate analgesic effects or prolong the sensory and motor blockade. Among the most widely studied classes of adjuncts are opioids, α2-adrenergic agonists and corticosteroids, each with unique mechanisms of action and safety considerations. Opioids, particularly morphine and fentanyl, exert their effects by binding to opioid receptors in the dorsal horn of the spinal cord, enhancing analgesia without necessarily increasing motor block. Caudal administration of opioids has consistently demonstrated prolonged postoperative pain relief, although it is not without risks; urinary retention, nausea, pruritus and rare episodes of respiratory depression must be carefully monitored. The choice of opioid and dose is therefore critical to balancing analgesic benefit against potential adverse effects.

Adrenergic agonists, such as clonidine and dexmedetomidine, have garnered increasing interest as adjuncts in pediatric and adult caudal anesthesia. By stimulating presynaptic α2-receptors in the spinal cord, these agents inhibit the release of norepinephrine and reduce sympathetic outflow, leading to both analgesia and sedation. Studies consistently show that clonidine and dexmedetomidine significantly prolong the duration of caudal block when added to local anesthetics, often with minimal hemodynamic compromise. Notably, dexmedetomidine may offer a more predictable and longer-lasting effect compared to clonidine, though careful titration is essential to prevent bradycardia or hypotension.

Corticosteroids, particularly dexamethasone, have emerged as a non-opioid adjunct with the potential to extend the duration of caudal analgesia. The exact mechanism remains under investigation, but it is hypothesized that dexamethasone modulates inflammatory mediators and nociceptive signaling within the spinal cord, thereby prolonging analgesic efficacy. The addition of dexamethasone to local anesthetics has been associated with a substantial increase in pain-free intervals postoperatively without the opioid-related side effects, making it an attractive option in certain patient populations.

Other adjuncts, including ketamine, magnesium sulfate and midazolam, have also been evaluated, although their use is less widespread due to concerns regarding neurotoxicity, hemodynamic effects, or inconsistent efficacy. Ketamine, as an N-methyl-D-aspartate (NMDA) receptor antagonist, provides analgesia by attenuating central sensitization. When used in low caudal doses, it can extend the block's duration, but its psychomimetic effects warrant cautious application. Magnesium sulfate, acting via NMDA receptor modulation, similarly prolongs analgesia but requires more robust safety data before widespread recommendation.

The clinical implications of adjuncts in caudal anesthesia extend beyond mere duration of analgesia. Prolonged pain relief can reduce opioid consumption, lower the incidence of postoperative nausea and vomiting, facilitate earlier mobilization and improve overall patient satisfaction. However, the choice of adjunct must be individualized, taking into account patient age, comorbidities, surgical procedure and risk of adverse effects. While evidence supports the efficacy of α2-adrenergic agonists and certain opioids, head-to-head comparisons are limited and optimal dosing strategies continue to evolve. Moreover, the long-term safety of newer agents, particularly in pediatric populations, remains an area of active research.

Adjuncts to caudal anesthesia represent a powerful tool to extend analgesic duration and enhance postoperative comfort. Opioids, α2-adrenergic agonists and corticosteroids each offer distinct advantages and their judicious use can transform a

Correspondence to: Samuel Thompson, Department of Anesthesiology, Midwestern Institute of Medical Sciences, Lakeport, USA, E-mail: s.thompson@anesth.mmi-au.edu

Received: 18-Mar-2025, Manuscript No. JACR-25-39318; **Editor assigned:** 21-Mar-2025, PreQC No. JACR-25-39318 (PQ); **Reviewed:** 04-Apr-2025, QC No. JACR-25-39317; **Revised:** 09-Apr-2025, Manuscript No. JACR-25-39318 (R); **Published:** 16-Apr-2025, DOI: 10.35248/2155-6148.24.16.1179

Citation: Thompson S (2025). Adjuncts to Caudal Anesthesia for Prolonging Analgesic Duration. J Anesth Clin Res. 16: 1179.

single-shot caudal block from a short-term intervention into a prolonged analgesic strategy. Future studies should aim to refine dosing regimens, compare efficacy between adjunct classes and ensure safety across diverse patient populations. By continuing to explore and optimize these combinations, anesthesiologists can achieve more predictable, effective and patient-centered analgesia in both pediatric and adult surgical care.