

Updates on Multimodal Analgesia for Orthopedic Surgery

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KEYWORDS

• Multimodal analgesia • Orthopedic surgery • Acetaminophen • Ketorolac
• Ibuprofen • Celecoxib • Ketamine • Gabapentinoids

KEY POINTS

- Multimodal analgesia improves analgesic outcomes after orthopedic surgery and minimizes opioids and their side effects.
- Newer nonopioid agents, including IV acetaminophen, IV ibuprofen, and intranasal (IN) ketorolac, are effective multimodal analgesics but cost considerably more than oral formulations and the cost-benefit ratio should be considered when using them.
- Gabapentinoids can help reduce postoperative opioid consumption and improve analgesia after orthopedic surgery.
- Celecoxib can reduce postoperative opioid consumption and improve analgesia after orthopedic surgery.
- Ketamine is a potent analgesic that is most useful in very painful surgery and in opioid-tolerant patients and may be considered for orthopedic surgery.

INTRODUCTION

Orthopedic surgery was one of the first specialties to embrace multimodal analgesia and incorporate it into practice more than a decade ago. Orthopedic surgeries are considered to be some of the most painful procedures patients undergo. Multimodal analgesia, which asserts that the combination of medications with different mechanisms of action provide superior pain relief and fewer side effects compared with a

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single class of medication, improves analgesic outcomes in orthopedic surgery.¹ This approach emphasizes using nonopioid adjuncts, such as acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), *N*-methyl-D-aspartate (NMDA)-receptor antagonists, gabapentinoids, α_2 -receptor agonists, and local anesthetics. With the current opioid epidemic in the United States, an emphasis on multimodal analgesia is essential to minimize unnecessary opioid use and manage opioid-tolerant patients. Additionally, multimodal analgesia may help promote early mobilization and discharge, lead to fewer readmission rates, and improve patient satisfaction.^{2,3}

To understand the basis for multimodal analgesia, a review of the physiology of pain and its transmission is helpful. The nervous system is made up of a complex system of peripheral nociceptors that extract information from the environment and carry these signals to the central nervous system where they are processed, interpreted, and lead to a physiologic effect. Multiple pain sites may be targeted to disrupt its transmission (**Fig. 1**). At a basic level, pain is divided into nociceptive and neuropathic types. Nociceptive pain occurs with tissue damage, whereas neuropathic pain occurs after damage to the nerve itself. Based on the type, location, and severity of pain experienced by the patient, one or more sites in the pain pathway may be targeted. For example, local anesthetics (via peripheral nerve blocks, neuraxial blocks, intravenous [IV] route, or wound infiltration) provide effective relief for nociceptive (somatic) pain. Neuropathic pain can often be treated with gabapentinoids (gabapentin or pregabalin) or NMDA-receptor antagonists, such as ketamine. Pain after orthopedic surgery is often complex, and it is with this understanding that we describe specific agents used in orthopedic surgery in this article with particular focus on newer agents (**Table 1**).

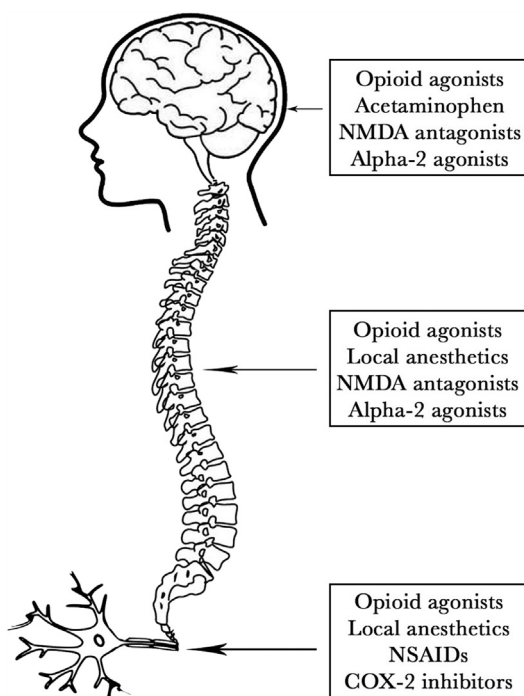


Fig. 1. Multimodal analgesic sites of action in the central and peripheral nervous systems. COX, cyclooxygenase.

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