

Postoperative Pain Management After Ambulatory Surgery: Role of Multimodal Analgesia

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- Nonopioid analgesics

Postoperative pain remains a challenging problem, which requires a proactive approach using a variety of treatment modalities to obtain an optimal outcome with respect to enhancing patient comfort and facilitating the recovery process. Multimodal (or balanced) analgesia represents an increasingly popular approach to preventing postoperative pain. The approach involves administering a combination of opioid and nonopioid analgesics that act at different sites within the central and peripheral nervous systems in an effort to improve pain control while eliminating opioid-related side effects.¹⁻⁵ The adaptation of multimodal (or balanced) analgesic techniques as the standard approach for the prevention of pain in the ambulatory setting is one of the keys to improving the recovery process after day-case surgery.^{1,6}

Poorly controlled pain is a major factor contributing to a delayed discharge after ambulatory surgery.^{2,4} Improving postoperative pain control accelerates the ability of patients to resume their activities of daily living.⁵ Many patients undergoing ambulatory surgery continue to experience unacceptably high levels of pain after their operation.²⁻⁴ Despite recent advances in our knowledge of multimodal analgesic therapies¹ and progress in our understanding of the pathophysiologic basis of acute pain, there remains a need for clinicians to implement evidence-based, procedure-specific

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multimodal analgesic protocols, which are modified to meet the needs of individual patients and to enhance the quality of postoperative pain management.⁶

The armamentarium of analgesic drugs and techniques for the management of postoperative pain continues to grow at a rapid rate. However, there seems to be a significant disconnect between the publication of analgesic studies in the peer-reviewed literature, demonstrating approaches to improving acute pain management and the application of these concepts in clinical practice. A part of the problem relates to the increasing number and complexity of elective operations that are being performed on an ambulatory (or short-stay) basis in which the use of conventional opioid-based intravenous patient controlled analgesia and central neuraxial (spinal and epidural) analgesia techniques are simply not practical for acute pain management. This rapidly expanding patient population requires an aggressive perioperative analgesic regimen that provides effective pain relief, has minimal side effects, is intrinsically safe, and can be managed by the patient and their family members away from a hospital or surgical center.

One of the most important factors in determining when a patient can be safely discharged from a surgical facility, and that also has a major influence on the patient's ability to resume their normal activities of daily living, is the adequacy of postoperative pain control.^{3,7} Perioperative analgesia has traditionally been provided using potent opioid (narcotic) analgesics. However, extensive reliance on opioid medication for acute pain management is associated with a variety of perioperative complications (eg, drowsiness and sedation, postoperative nausea and vomiting (PONV), pruritus, urinary retention, ileus, constipation, ventilatory depression), which can contribute to a delayed hospital discharge and resumption of normal activities of daily living.⁸ Anesthesiologists are increasingly using a combination of nonopioid analgesic medications as the first line of therapy for the prevention of pain in the postoperative period. However, opioid analgesics will likely remain the primary treatment option for patients who require rescue analgesic therapy in the postoperative period until more potent and rapid-acting nonopioid analgesics become available for routine clinical use.

In 2000, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) introduced new standards that mandated pain assessment and treatment as part of routine patient care in an attempt to improve control of acute pain. Many medical institutions have misinterpreted this mandate as requiring that the treatment of pain must be guided by patient reports of pain intensity indexed to a numerical pain scale.⁵ After the implementation of a routine numeric pain scoring system in the recovery room, Frasco and colleagues⁹ reported a significant increase in the use of opioid analgesics. Vila and colleagues¹⁰ reported that as a result of the JCAHO-mandated policy for pain management, the incidence of opioid-related adverse reactions increased from 11 to 25 per 100,000 inpatient days at their medical center. Most adverse drug reactions were preceded by a documented decrease in the patient's level of consciousness due to opioid-related sedation. In the ambulatory setting, the primary factor responsible for postdischarge nausea and vomiting is the use of oral opioid-containing analgesics.¹¹ Raeder and colleagues¹² reported that the use of ibuprofen after ambulatory surgery was associated with fewer gastrointestinal side effects (eg, PONV, constipation) when compared with the use of an oral combination of acetaminophen and codeine.

Early studies evaluating approaches to facilitating the recovery process have demonstrated that the use of multimodal analgesic techniques can improve early recovery as well as other clinically meaningful outcomes after ambulatory surgery.^{13,14} These benefits have been confirmed in more recent studies^{15,16} and are currently the recommended practice in most fast-track clinical care plans.⁵ It is clear that the

reliance on a single nonopioid analgesic modality (eg, local analgesics, nonsteroidal antiinflammatory drugs [NSAIDs], and/or acetaminophen) will not suffice to control moderate to severe postoperative pain, and excessive reliance on opioid analgesics produces undesirable side effects.^{8,17} The short- and long-term benefits of using multimodal analgesia regimens to reduce opioid-related side effects remain controversial, because the definition of multimodal analgesia is not uniform in the anesthesia and surgery literature.¹ In some contexts, multimodal analgesia refers to systemic administration of analgesic drugs with different mechanisms of action, whereas in other situations it refers to concurrent application of analgesic pharmacotherapy in combination with regional analgesia.

A deficiency in the design of many of the published studies involving multimodal analgesic therapies is that the drug regimens were not continued into the postdischarge period.¹⁸ For example, only immediate pre- and postoperative administration of the cyclooxygenase 2 (COX-2) inhibitor rofecoxib as part of a multimodal analgesic regimen in outpatients undergoing inguinal hernia repair provided limited benefits beyond the early postoperative period.¹⁹ However, when the COX-2 inhibitors are administered for 3 to 5 days after ambulatory surgery,^{15,16} the greater benefits were achieved with respect to clinically relevant patient outcomes (eg, resumption of normal activities) and improvements in pain control. While opioid analgesics continue to play an important role in the acute treatment of moderate to severe pain in the early postoperative period, nonopioid analgesics will likely assume a greater role as preventative analgesics in the future as the number of minimally invasive (keyhole) surgery cases continues to expand.

Nonopioid analgesics are increasingly being used as adjuvants before, during, and after surgery to facilitate the recovery process after ambulatory surgery because of their anesthetic- and analgesic-sparing effects and their ability to reduce postoperative pain (with movement), opioid analgesic requirement, and side effects, thereby shortening the duration of the hospital stay. The use of traditional NSAIDs, COX-2 inhibitors, acetaminophen,^{20–23} ketamine,^{24,25} dexmedetomidine,^{26,27} dextromethorphan, alpha2-agonists, gabapentin,^{28–30} pregabalin,^{31–34} β -blockers,^{35–39} and glucocorticoid steroids can provide beneficial effects when administered in appropriate doses as part of a multimodal analgesic regimen in the perioperative setting.^{1,8,40} Dexamethasone when used as an adjuvant decreases oxycodone consumption and helps to reduce postoperative pain.^{41–43} Recent studies have confirmed that a rational combination of different nonopioid analgesics when given as part of multimodal analgesia reduces postoperative pain.^{32,44,45}

The potential beneficial effects of administering local anesthetics via alternative routes of administration for improving the perioperative outcomes continue to be investigated. The administration of intranasal lidocaine in combination with naphazoline decreased both intra- and postoperative pain and reduced rescue analgesic requirements in the postoperative period.⁴⁶ Although intra-abdominal administration of levobupivacaine was alleged to produce satisfactory analgesia in patients undergoing abdominal hysterectomy procedures, the study was flawed due to the failure to include a placebo control group.⁴⁷ However, other studies have demonstrated the effectiveness of the intravenous infusion of lidocaine in reducing postoperative pain and facilitating the recovery process.^{48–51} Yardeni and colleagues⁵² suggested that perioperative administration of intravenous lidocaine could improve early postoperative pain control and reduce surgery-induced immune alterations.

The use of continuous local anesthetic techniques (eg, for perineural blocks or wound infiltration) has become increasingly popular due to their ability to control moderate to severe pain after major ambulatory orthopedic surgery procedures.^{53–57} The availability

of disposable local anesthetic infusion systems and the encouraging results from these early studies have led to the increasing popularity of these techniques for pain control in the postdischarge period. However, the clear benefits of these approaches for managing pain after ambulatory surgery must be balanced against the cost of the equipment and the resources needed to safely manage these systems outside the hospital environment.

Topical capsaicin has also been found to produce prolonged analgesic effects because of its ability to alter nociceptive input at the peripheral nerve ending.⁵⁸ The use of transcutaneous electrical nerve stimulation and acupoint stimulation has also been reported to improve postoperative pain management. Because these techniques cause no adverse effects, their use as an adjunct to conventional pharmaceutical approaches could be considered, particularly for patients in whom conventional analgesic techniques fail and/or are accompanied by severe medication-related adverse events.^{59,60}

Preemptive analgesic techniques have been postulated to provide superior analgesia by preventing the establishment of central sensitization.⁶¹ However, this approach does not seem to offer any clinically significant advantages over so-called preventative multimodal analgesic regimens when an effective pro-active approach to pain management is initiated in the early postoperative period and extended into the postdischarge period.⁶²

Of importance for improving the quality of pain control and facilitating recovery in the future is the need to educate patients and their family members (caregivers) about the importance of continuing their analgesic medications after the patient leaves the hospital or day-surgery center. It is also important to emphasize the need for collaboration between the various health care providers involved in the patient's perioperative care (eg, anesthesiologists, surgeons, nurses, and physiotherapists) to integrate improved perioperative pain management strategies with the recently described fast-track recovery paradigms.⁵ This type of multi-disciplinary approach has been documented to improve the quality of the recovery process and reduce the hospital stay and postoperative morbidity, leading to a shorter period of convalescence after surgery.⁶³

A critical assessment of the peer-reviewed literature regarding the optimal analgesic therapies for outpatient laparoscopic cholecystectomy by Bisgaard⁶⁴ concluded that a multimodal analgesic regimen consisting of a preoperative single dose of dexamethasone, incisional local anesthetics (at the beginning and/or end of surgery), and continuous treatment with NSAIDs (or COX-2 inhibitors) during the first 3 to 4 days provided the best clinical outcome. It was further suggested that elimination of opioid-based analgesia would be highly desirable in the future. These important findings have been confirmed by White and colleagues.¹⁵ In a prospective, placebo-controlled study, involving the administration of celecoxib on the day of surgery and subsequently for 3 days after outpatient laparoscopic surgery as part of a multimodal analgesic regimen, it was found that celecoxib-treated patients not only experienced less pain and reduced need for opioid-containing oral analgesics but also (more importantly) were able to resume normal activities of daily living 1 to 2 days earlier.

With the more widespread use of multimodal perioperative analgesic regimens, involving both opioid and nonopioid analgesic therapies, physicians and nurses are becoming increasingly aware of the important role that these techniques play in facilitating the recovery process and improving patient satisfaction. Although many factors, in addition to pain, must be carefully controlled to minimize postoperative morbidity and facilitate the recovery process after elective surgery (eg, PONV,

hydration status), the adequacy of pain control should remain a major focus of health care providers, caring for patients undergoing ambulatory surgical procedures.^{17,19}

With the changes in health care dictated by economic pressures, there has been a realization that the duration of the hospital stay can be reduced without compromising the quality of patient care. Advances in surgical technology and anesthetic drugs and techniques have made an impact on the way perioperative care is currently being delivered to patients undergoing ambulatory surgery. Multidisciplinary fast-track or accelerated recovery processes encompass many aspects of anesthesia and analgesic care,⁵ optimizing not only the preoperative preparation and prehabilitation but also the intraoperative attenuation of surgical stress and postoperative pain control and rehabilitation procedures.⁶⁵

Current evidence suggests that these improvements in patient outcome related to pain control can best be achieved by using a combination of preventative analgesic techniques involving both central and peripheral-acting analgesic drugs as well as novel approaches to administering drugs in locations remote from the hospital setting. It is of critical importance for clinical investigators to return to the hard work of performing prospective, randomized clinical trials on a procedure-specific basis to evaluate the use of different analgesic combinations as part of multimodal analgesic treatment regimens in the postoperative period.^{63,66} Improving recovery after ambulatory surgery by optimizing anesthetic and analgesic techniques will benefit patients, health care providers, and society-at-large in the future.⁶⁷

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