

PAIN CONTROL IN AMBULATORY SURGERY

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Abstract: Day surgery, coming to and leaving the hospital on the same day as surgery as well as ambulatory surgery, leaving hospital within twenty-three hours is increasingly being adopted. There are several potential benefits associated with the avoidance of in-hospital care. Early discharge demands a rapid recovery and low incidence and intensity of surgery and anaesthesia related side-effects; such as pain, nausea and fatigue. Patients must be fit enough and symptom intensity so low that self-care is feasible in order to secure quality of care. Preventive multi-modal analgesia has become the gold standard. Administering paracetamol, NSAIDs prior to start of surgery and decreasing the noxious influx by the use of local anaesthetics by peripheral block or infiltration in surgical field prior to incision and at wound closure in combination with intra-operative fast acting opioid analgesics, e.g., remifentanyl, have become standard of care. Single preoperative 0.1 mg/kg dose dexamethasone has a combined action, anti-emetic and provides enhanced analgesia. Additional α -2-agonists and/or gabapentin or pregabalin may be used in addition to facilitate the pain management if patients are at risk for more pronounced pain. Paracetamol, NSAIDs and rescue oral opioid is the basic concept for self-care during the first 3–5 days after common day/ambulatory surgical procedures.

Keywords: ambulatory surgery; analgesia; multi-modal analgesia; balanced analgesia; postoperative pain

INTRODUCTION

By the end of the twentieth century, more than 70 % of all elective procedures in North America will be performed on an ambulatory basis. Postoperative pain is one of the main barriers to increasing the range of ambulatory procedures. Persistent pain has been shown to lead to postoperative nausea and vomiting, delayed discharge, [1] contact with medical facility after discharge, and unanticipated admissions. The rapid, immediate recovery afforded by the use of new, short-acting anesthetic agents has led to the concept of fast-tracking, bypassing the postanesthetic care unit (PACU) ; however, the economic benefits for fast-tracking will not be realized unless postoperative pain is well controlled.

ASSESSMENT OF POSTOPERATIVE PAIN

Pain, being a subjective phenomenon, is best assessed through direct estimation by patients using the visual analogue scale (VAS), or the verbal form, the verbal rating scale. Recognition and quantification of pain are essential steps in initiating pain management. Scoring can also aid the audit of the implementation of treatment protocols and monitor the effectiveness of different analgesic regimens. To familiarize patients with the use of pain-assessment scales, preoperative patient education can incorporate the assessment of patients' previous pain history and instructions to use the VAS and verbal rating scale.

CURRENT STATE OF POSTOPERATIVE PAIN CONTROL

Under treatment of pain is common in outpatients." Beauregard et al" reported that 40% of discharged outpatients suffered from moderate to severe pain during the first 24 hours. Approximately 50% of patients reported that instructions about pain control were either unclear or nonexistent; however, more than 80% of patients were satisfied with the pain control, and the overall medication use was low. Scott and Hods-n~ also found that attitudes about pain varied greatly. Most patients were prepared to suffer pain and had little understanding of the pain-control methods.

IDENTIFICATION OF AT-RISK GROUPS

A number of considerations have to be reconciled when planning the most appropriate pain management. The age, physical condition, and capabilities of patients are important. The preoperative patient preparation and education, presence of preoperative pain and anxiety, the site and extent of surgery, the planned technique of anesthesia, and the likely intensity of postoperative pain must be carefully considered. Chung et al [4] found that orthopedic procedures and the duration of anesthesia were predictors of postoperative pain.

GENERAL PRINCIPLES

Optimal postoperative pain control for ambulatory surgery should be effective and safe, produce minimal side effects, facilitate recovery, and be easily managed by patients after discharge. The management of postoperative pain should follow the principle of providing a general background level of analgesia sufficient to permit normal activities, together with the use of additional analgesic supplements to cover any painful activity. In a before-and-after audit over 6 weeks involving 203 patients, Marquardt and Ra-is'~ advocated prepackaged take-home analgesia specific to the type of operation performed. The operations were classified as mild, moderate, or severe. Breakthrough medications were prescribed in addition to regular around-the-clock medication. This approach led to an improvement in pain control, mobility, and sleep.

MULTIMODAL ANALGESIA

Postoperative analgesia can be broadly classified into pharmacologic and non-pharmacologic techniques. The mainstay of pharmacologic techniques is the use of opioids; however, opioids are associated with side effects, such as nausea, vomiting, and sedation, that may lead to delayed discharge or unanticipated admissions. Nonopioid techniques include local anesthetics, such as peripheral nerve blocks, wound infiltration or instillation, and nonsteroidal anti-inflammatory drugs (NSAIDs). Non-pharmacologic techniques include cryoanalgesia, hypnosis and relaxation, transcutaneous electric nerve stimulation (TENS), and acupuncture-like TENS. Combination regimens have been suggested to be more rational and effective. Combinations of analgesics that act by different mechanisms result in additive or synergistic analgesia and lower total doses of analgesics, with reduced side effects. Therefore, a multimodal approach to the treatment of patients with postoperative pain has been recommended. Multimodal analgesia, using a combination of opioid, NSAID, and local anesthetic, is superior to any modality alone, and the technique is highly recommended.

TIMING OF ANALGESIA-PREEMPTIVE ANALGESIA

ANALGESIA Preemptive analgesia is an attractive working hypothesis; however, the evidence so far cannot support a major benefit of preemptive analgesia in postoperative pain management. Kehlet examined 11 controlled trials, of which 3 were outpatient trials, comparing the analgesic effect of the same treatment administered before or after the initiation of surgery, and concluded that timing of analgesic administration was of no major importance in the management of postoperative pain [6]. Ejlerson et al [7] demonstrated a difference of 1 hour in the time to first request for postoperative analgesics; however, they failed to demonstrate a significant difference in pain scores. Anderson [8] found lower postoperative pain scores and analgesic requirements; however, a higher mean plasma paracetamol concentration was associated with the preincision medications as a result of the different formulation. Although evidence is lacking for preemptive analgesia, preoperative administration of nonopioid analgesia can be an important factor in providing intraoperative analgesia, thereby reducing the intraoperative opioids and anesthetic requirements and facilitating a smooth and rapid recovery.

SYSTEMIC OPIOIDS

Opioids are the mainstay of postoperative pain therapy; however, opioid analgesia has to be balanced against the side effects engendered, mainly nausea and vomiting. Therefore, outpatient studies on opioids have focused on finding the particular opioid and the timing of administration that would lead to a lower incidence of postoperative nausea and vomiting. Claxton et al [9] compared morphine and fentanyl for postoperative pain relief in the PACU after painful ambulatory procedures. The administration was titrated to keep the VAS less than 40. For patients who received fentanyl in the PACU, the VAS was higher in the ambulatory surgical unit

compared with the morphine group. The incidence of nausea and vomiting in the PACU and ambulatory surgical unit, recovery milestones, and time to home readiness were not significantly different among the two groups ; however, the morphine group had more frequent postoperative nausea and vomiting after discharge. Wong et al [10] investigated the incidence and severity of postoperative nausea and vomiting after different timing of morphine administration in patients undergoing outpatient orthopedic procedures. Morphine was administered intra- operatively 5 minutes after incision versus in the PACU. The incidence and VAS for nausea were not significantly different among the two groups. Rasanayagam and Harrison [11] compared the preoperative oral administration of 10 mg morphine 1 hour before operation versus placebo. No significant difference was found regarding postoperative VAS, analgesia consumption, and the incidence of nausea and vomiting; however, the patients in the PACU were given 10 mg intramuscular bolus for pain relief without titrating to the VAS. This morphine bolus dose was too big to allow identification of the benefits of preoperative morphine on postoperative pain. To avoid postoperative nausea and vomiting, the use of postoperative opioids should be minimized. In painful outpatient procedures, opioids may be needed to treat patients with severe pain. In this case, the use of lower doses (0.1 mg.kg-1) of intravenous (IV) morphine in the PACU did not cause more nausea and vomiting during the patients' hospital stay compared with fentanyl.

SYSTEMIC NONSTEROIDAL ANTI-INFLAMMATORY DRUGS

The efficacy of preoperative NSAID administration for postoperative pain has been extensively investigated in randomized, controlled trials. Comparing NSAIDs with placebo, most studies demonstrated a decrease in postoperative pain scores or analgesic requirements. NSAIDs also gave rise to a lower side-effects profile during recovery. Most outpatient studies comparing NSAIDs with opioids for perioperative use demonstrated that opioids provided comparable or better pain relief in the early recovery period, whereas NSAIDs provided better pain relief at the late recovery period. The studies that did not show a significant difference in the pain relief had inadequate sample sizes or methodologic flaws. Combining opioids with NSAIDs, therefore, allows for a rapid effect of opioids, followed by a longer analgesic duration of NSAIDs. The efficacy of NSAIDs for postoperative pain relief depends on the timing and route of administration. Because of their peripheral mechanisms of action, NSAIDs have longer onsets than do opioids, and, therefore, parenteral NSAIDs are usually administered at induction or intraoperatively, allowing adequate time for them to exert their peak effect. Although NSAIDs are available for both parenteral and enteral administration, oral or rectal preparations are less expensive. Oral administration, however, may be associated with erratic absorption and may require a long time for absorption. Studies demonstrate that enteral NSAIDs are as effective as their parenteral counterparts when given preoperatively to allow at least 1 hour for absorption. No scientific documentation of the superiority of any individual NSAID for peri- operative use exists. The choice of preparation, therefore, depends on availability, desired route of administration, duration of effect, and cost. The side effects of NSAIDs seem minimal, except in

patients with active gastroduodenal ulceration, renal dysfunction, bleeding tendency, or allergy to aspirin. Systemic NSAIDs are effective analgesics with prolonged action and minimal side effects. The combined use of opioids and NSAIDs is ideal for treatment of severe pain because of its rapid onset and prolonged action. Therefore, the use of NSAIDs is highly recommended in ambulatory surgery.

SPINAL AND EPIDURAL ANALGESIA

Knee arthroscopy and gynecologic laparoscopy are common outpatient procedures that can be performed with the patient under spinal or epidural anesthesia. Central neuraxial block has the advantages of providing a better postoperative analgesia and a lower incidence of side effects, such as sedation, nausea, and vomiting ; however, the disadvantages include a longer preparation time for anesthesia compared with general anesthesia, a higher incidence of urinary retention, pruritus, and prolonged recovery. Dahl et al [12] investigated the use of 5 % spinal lidocaine versus epidural 2 % mepiva- caine versus propofol anesthesia for knee arthroscopy. The preparation time for anesthesia was significantly longer in the spinal (23 ± 4.8 min) and epidural (31 ± 9.1 min) groups than in the propofol (7.4 ± 5.4 min) group. The time lost in the spinal and epidural groups was not compensated by the shorter time interval from the end of operation to arrival in the recovery room. The level of postoperative pain, however, was significantly lower in the spinal and epidural groups, with a lower VAS and analgesic requirement up to 180 minutes postoperatively. No significant difference was found in the incidence of postoperative emesis and the time to home readiness. With a shorter preparation time, spinal anesthesia is more commonly used in outpatient procedures than is epidural anesthesia. Several studies have investigated the use of low-concentration, low-dose spinal anesthetics and the addition of an intrathecal opioid to take advantage of prolonged postoperative analgesia, while avoiding postoperative motor block, urinary retention, and prolonged recovery time. Short- acting and lipophilic opioids, such as fentanyl, have been used successfully in the outpatient setting. The effects of fentanyl subside within 2 hours. The better analgesia provided by the spinal opioids in the PACU enables easier transition to oral analgesics. Urmey et al [13] compared 2 % isobaric lidocaine, 40 mg versus 60 mg versus 80 mg intrathecally, in a combined spinal epidural anesthesia for 90 patients undergoing knee arthroscopy. The sensory and motor blocks were shorter in the 40 mg group; the time to various recovery milestones was also shorter; however, 10 % of the 40 mg and 60 mg and 3.3 % of the 80 mg group required epidural supplementation after 49 ± 11 minutes in all groups. Chilvers et al [14] subsequently investigated three doses of fentanyl supplements (0 versus 10 versus 25 mg) with 20 mg of hypobaric lidocaine for spinal anesthesia in 64 patients undergoing gynecologic laparoscopies. Intraoperative condi- tions were most satisfactory with 25 mg fentanyl. Sensory recovery was longer, and thus the postoperative analgesia was better with 25 mg fentanyl, although the motor recovery and the discharge times were similar with the other groups. Pruritus was the only side effect that occurred more often in the 10 mg and 25 mg groups. Vaghadia et al [15] compared 25 mg hypobaric lidocaine and 25 mg fentanyl with 75 mg hyperba- ric lidocaine and found that the conventional dose (75 mg) of

lidocaine required longer duration for sensory and motor recovery. Spinal anesthesia was associated with a shorter preparation time than was epidural anesthesia, and spinal anesthesia showed a lower incidence of postoperative pain and a smoother transition to oral analgesics compared with general anesthesia. The use of spinal anesthesia in ambulatory settings is facilitated by using low-dose, low-concentration, short-acting spinal anesthetics with the addition of a lipophilic opioid.

WOUND INSTILLATION OR INFILTRATION

Wound instillation or infiltration can provide both intraoperative and postoperative analgesia, facilitating a rapid and smooth recovery. Subfascial infiltration, parietal peritoneal infiltration, and subcutaneous infiltration or field block were shown to reduce postoperative pain and analgesic requirements in outpatient studies. In contrast, the inpatient studies showed conflicting results, either because of inadequate sample sizes or a failure in standardization of the postoperative assessment of pain. Wound instillation or infiltration is a simple, effective technique with minimal side effects. Wound instillation or infiltration is highly recommended for postoperative pain relief in ambulatory surgery.

OTHER TECHNIQUES

Transcutaneous electric nerve stimulation involves the theory of gate control modulation and the inhibitory fibers centrally. Therefore, TENS should be most effective in relieving pain from trauma to muscles, bones, or peripheral nerves; however, TENS was found to be ineffective in randomized, controlled trials for 20 patients who underwent lumbar laminectomy. Acupuncture-like TENS, or electroacupuncture, was found in one study to reduce the opioid requirement in the first 2 hours if given immediately after surgery. Wang et al [16] found that acupuncture-like TENS decreased the postoperative opioid requirement and its side effects by 65%. On the other hand, conventional acupuncture has been associated with an increase in postoperative analgesic requirements and higher pain scores. Hypnosis and relaxation techniques have been found to have variable quality of analgesia, depending on the characteristics of the patients and the pain stimuli, and, therefore, success has been variable. Cryo-analgesia for the ilioinguinal nerve in patients undergoing inguinal herniorrhaphy was not more effective than was placebo.

NEW OPIOID DELIVERY SYSTEMS

The new delivery systems aim to provide portable analgesia in a stable fashion, either continuous or on demand, to achieve better analgesia, lower total opioid doses, and fewer unwanted side effects. The new opioid delivery systems include subcutaneous patient-controlled analgesia (PCA); iontophoresis; and transdermal, intra-nasal on-demand, and oral transmucosal fentanyl.

Although the use of transdermal fentanyl was associated with better postoperative analgesia in shoulder and abdominal surgery, its use in the outpatient setting is limited because it has a long latency to onset and stable serum level (15 h). In addition, its effect is prolonged. Following patch removal, the serum level decreased only to 50 % in 21 hours. Oral transmucosal fentanyl has a rapid onset of analgesia and an acceptable rate of side effects. Ashburn et al [17] have shown that the use of oral transmucosal fentanyl, 7 to 10 mg.kg⁻¹, was associated with a lower postoperative analgesic requirement after total hip or knee replacement. Intranasal on-demand fentanyl has been compared with equal dosages of IV PCA fentanyl for postoperative pain relief after orthopedic surgery. The onset was found to be rapid, and the analgesic effects were similar with no increase in side effects. Subcutaneous opioid PCA has been studied with oxymorphone, hydromorphone, and morphine. The studies had shown that subcutaneous PCA was as effective as conventional IV PCA, although the dose was 10 % to 30 % higher. The potential use of disposable PCA pumps may permit the use of subcutaneous PCA in outpatient settings. Iontophoresis, a process in which ionizable drugs are electrically charged and propelled through the skin by an external electric field, has a more rapid onset and an ability to switch on and off drug delivery compared with the passive transdermal therapeutic system. Iontophoresis has only been studied in volunteers, and the clinical use of this delivery method is still under investigation.

SUMMARY

Optimizing postoperative pain control is the key to further advancement in the field of ambulatory anesthesia. The current situation in postoperative pain management indicates room for improvement, especially in the area of patient education and the development of individualized discharge analgesic packages. Multimodal analgesia provides superior analgesia with a lower side-effect profile. Preoperative administration of analgesia would decrease the intraoperative analgesic requirement, which may lead to a smooth and rapid recovery. Finally, new, portable analgesic delivery systems are under investigation and may prove to be the method of choice for future postoperative pain management in ambulatory anesthesia.

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