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Original contribution

Effects of postoperative background PCA morphine infusion on pain management and related side effects in patients undergoing abdominal hysterectomy☆

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Abstract

Study Objective: To examine the effects of background morphine infusion via patient-controlled intravenous analgesia (PCA) device.

Design: Randomized, controlled, double-blinded study.

Setting: University-affiliated hospital.

Patients: 60 ASA physical status 1 and 2 patients scheduled for abdominal hysterectomy.

Interventions: Patients were randomly allocated to either the PCA group without continuous background morphine infusion (Group 1; n = 30) or the PCA group with continuous background morphine infusion (Group 2; n = 30).

Measurements: Pain intensity during movement and at rest, morphine consumption at indicated time intervals, and related side effects were evaluated and recorded for three postoperative days at 12-hour intervals. The degree of patient satisfaction with PCA pain management was elicited and recorded.

Main Results: Pain intensity during movement (VASC) at 12 and 36 hours postoperatively and pain intensity at rest from 12 to 60 hours were significantly higher in Group 2 than Group 1. PCA morphine consumption for three days postoperatively in Group 2 was significantly higher. The frequency of vomiting, nausea, and dizziness were higher in Group 2. The frequency of pruritus, urinary retention, and allodynia was similar for both groups. The degree of patient satisfaction with pain management was generally equivalent between the groups.

Conclusion: A continuous background morphine infusion of 0.5 mg/hr did not lower pain intensity during movement or at rest, but induced higher pain intensity, higher opioid usage, and more complications such as vomiting, nausea, and dizziness.

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1. Introduction

In an attempt to improve postoperative pain, physicians may be tempted to increase the dosage of opioids for those patients whom they believe to be drug-tolerant, but also may be increasing their patients' pain. Kissin et al. showed that rats receiving intravenous (IV) morphine at relatively high doses developed acute tolerance [1], and Guignard et al. also found that relatively large-dose intraoperative remifentanil induced acute opioid tolerance leading to increased postoperative pain and increased morphine consumption [2]. In a previous study, women receiving abdominal hysterectomies administered large doses of IV fentanyl during the induction of anesthesia had greater postoperative pain and increased need for larger doses of opioids than those receiving smaller doses of fentanyl [3]. Findings such as these sparked much research interest and led our department of anesthesia to avoid administering high doses of opioids intraoperatively, including for such painful operations as thoracic or vascular surgery.

Although opioids are the major choice of postoperative pain management, some concerns such as obvious side effects and potential tolerance still should be kept in mind. Some studies comparing the two types of patient-controlled analgesia (PCA) suggest that users of continuous PCA infusion of morphine have similar postoperative pain intensity but consume more morphine and have a greater incidence of adverse effects [4-8]. However, one study reported better postoperative analgesia [9]. Due to the inconsistency of results and the continued wide use of PCA, we performed a prospective, randomized study to evaluate the effectiveness of pain management and occurrence of side effects in two groups of women who underwent abdominal hysterectomies: one group receiving self-administered PCA only (PCA) and the other receiving continuous PCA with the ability to add extra doses if needed (continuous PCA).

2. Materials and methods

Approval by the Human Investigation Committee of Kaohsiung Veterans General Hospital was given before the implementation of the study. Written, informed consent was obtained from 60 ASA physical status 1 and 2 patients who were to undergo abdominal hysterectomies. Exclusion criteria included 1) immediate extubation was not planned after surgery, 2) history of drug or alcohol abuse, 3) psychiatric disorder, 4) history of chronic pain, 5) contraindications to the self-administration of opioids (unable to understand how to use PCA). Patients were randomized to two groups using a table of random digits generated by computer.

Before the operation, patients were instructed about use of the combination of the visual and numerical rating scales (VAS; 0 = no pain, 10 = worst possible pain) and the PCA device (Pain Management Provider; Abbott, Abbott Park, IL, USA). General anesthesia was standardized and induced with fentanyl 3.0 mg/kg fentanyl, thiopental sodium 5 mg/kg, and succinylcholine 1.5 mg/kg. Atracurium and isoflurane were adjusted during surgery to maintain muscle relaxation and the depth of anesthesia. Patients' lungs were ventilated with 50% oxygen in air at a tidal volume of 8 to 10 mL/kg, with end-tidal CO2 concentration ($ETCO_2$) maintained at 35 to 40 mmHg. Insufficient anesthesia was defined as a bispectral index (BIS) score of 60 or greater. Patient movement, coughing, tearing, and sweating also were considered signs of inadequate anesthesia. Inspired isoflurane concentration was increased stepwise by 1% when insufficient anesthesia was suspected. Hypotension, defined by a systolic arterial pressure less than 80 mmHg or a mean arterial pressure less than 60 mmHg, prompted stepwise 1% reductions in isoflurane concentration for BIS values that remained less than 60. Additional IV fluids also were given as deemed appropriate by the responsible anesthesiologist. Similarly, atropine or intermittent boluses of ephedrine were administered as required to treat bradycardia or persistent hypotension. At the end of surgery, muscle relaxation was reversed with IV neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg for all patients. Intraoperative monitoring included electrocardiography (ECG), blood pressure, pulse oximetry, nasopharyngeal temperature, neuromuscular status, measurement of ventilation pressures and volumes, $ETCO_2$, and urine output. To avoid intraoperative hypothermia, each patient was placed on a water-warming blanket. The trachea was extubated when the patient responded to verbal commands, spontaneous respiratory rate (RR) exceeded 12 breaths/min, and partial pressure of end-tidal carbon dioxide ($PETCO_2$) was less than 45 mmHg. An anesthesiologist who was blinded to group allocation and who was uninvolved in postoperative evaluation or patient contact, conducted the entire course of surgical anesthesia. Patients were transferred to the Postanesthesia Care Unit (PACU) within 5 minutes of tracheal extubation. They remained in the PACU for at least two hours and were given oxygen via a facemask at a rate of 3.0 L/min throughout this period.

At the end of surgery, each patient received a PCA machine that was programmed to deliver a 2.5 mL/bolus (morphine 1.0 mg; Group 1) with a lockout interval of 5 minutes and a 20 mg morphine limit every 4 hours; or combined with a background infusion of 1.25 mL/hr (morphine 0.5 mg; Group 2). A loading dose of IV morphine 4 mg was given to each patient. The PCA morphine was prepared under the laminar flow hood and programmed in the Department of Pharmacy; therefore, each patient was blinded to her assignment.

Patient-controlled analgesia was used continuously for three postoperative days, and pain intensity during coughing or deep breathing (VASC) and at rest (VASR) was evaluated and recorded using a combination of the visual and numerical rating scales (VAS: 0-10) scoring system twice daily at